

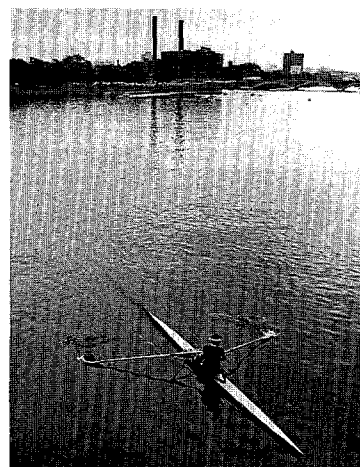
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Report of the Southeastern New England Study



a Strategy for Balanced Development
and Protection of Water and Related
Land Resources in Eastern
Massachusetts and Rhode Island

6. TAUNTON PLANNING AREA REPORT

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The Southeastern New England Study (SENE) is a "level B water and related land resources study." It was conducted under the provisions of the federal Water Resources Planning Act of 1965. The resources management program the Study produced was developed by a team of federal, state, and regional officials, local citizens, and the scientific community, under the overall coordination of the New England River Basins Commission. It is a part of the Commission's comprehensive, coordinated joint plan for the water and related land resources of New England.

The recommended program for managing the resources of Southeastern New England is described, in increasing level of detail, in the following Final Reports:

A SUMMARY highlighting the principal findings and recommendations of the Study, and their implications for the future of the region.

A REGIONAL REPORT and Environmental Impact Statement describing *in detail* the natural resources, issues and problems facing the region, the alternative solutions examined during the Study, the recommendations made, and their implications. It includes policies and programs for dealing with water supply, land use, water quality, outdoor recreation, marine resources, flood and erosion protection, and key facilities siting, and the changes in state and local government required to implement the program.

Ten PLANNING AREA REPORTS dealing with the same subjects as the Regional Report, but aimed at the local level. Eastern Massachusetts and Rhode Island were divided into ten "planning areas" based either on traditional sub-state divisions or principal river basins. Reports were prepared for the following areas:

1. Ipswich-North Shore,
2. Boston Metropolitan,
3. South Shore,
4. Cape Cod and the Islands,
5. Buzzards Bay,
6. Taunton,
7. Blackstone and Vicinity,
8. Pawtuxet,
9. Narragansett Bay and Block Island,
10. Pawcatuck

Other reports prepared during the course of the Study include the following:

Inventory Reports

For each of the ten planning areas, inventory reports were prepared covering the following subjects: climate, meteorology, hydrology, geology; land use, patterns, allocations, and management; special environmental factors; water supply; ground water management; water quality control; outdoor recreation; fish and wildlife; navigation; flood plain zoning and streamflow management; inland wetlands management; coastal resources; irrigation and drainage; sediment and erosion; power; minerals.

Special Reports

In addition to inventory reports, over a dozen special reports were prepared, including: Socio-Economic and Environmental Base Study, Volumes I and II; Economic analyses of water supply and demand issues, power plant siting, coastal resources allocation, and sand and gravel mining; Legal and institutional analyses of the state wetlands laws, arrangements for water supply service, fiscal policy and land control, access to natural resources areas, and management structure for water and land use issues; Urban Waters Special Study; Summaries of public workshops

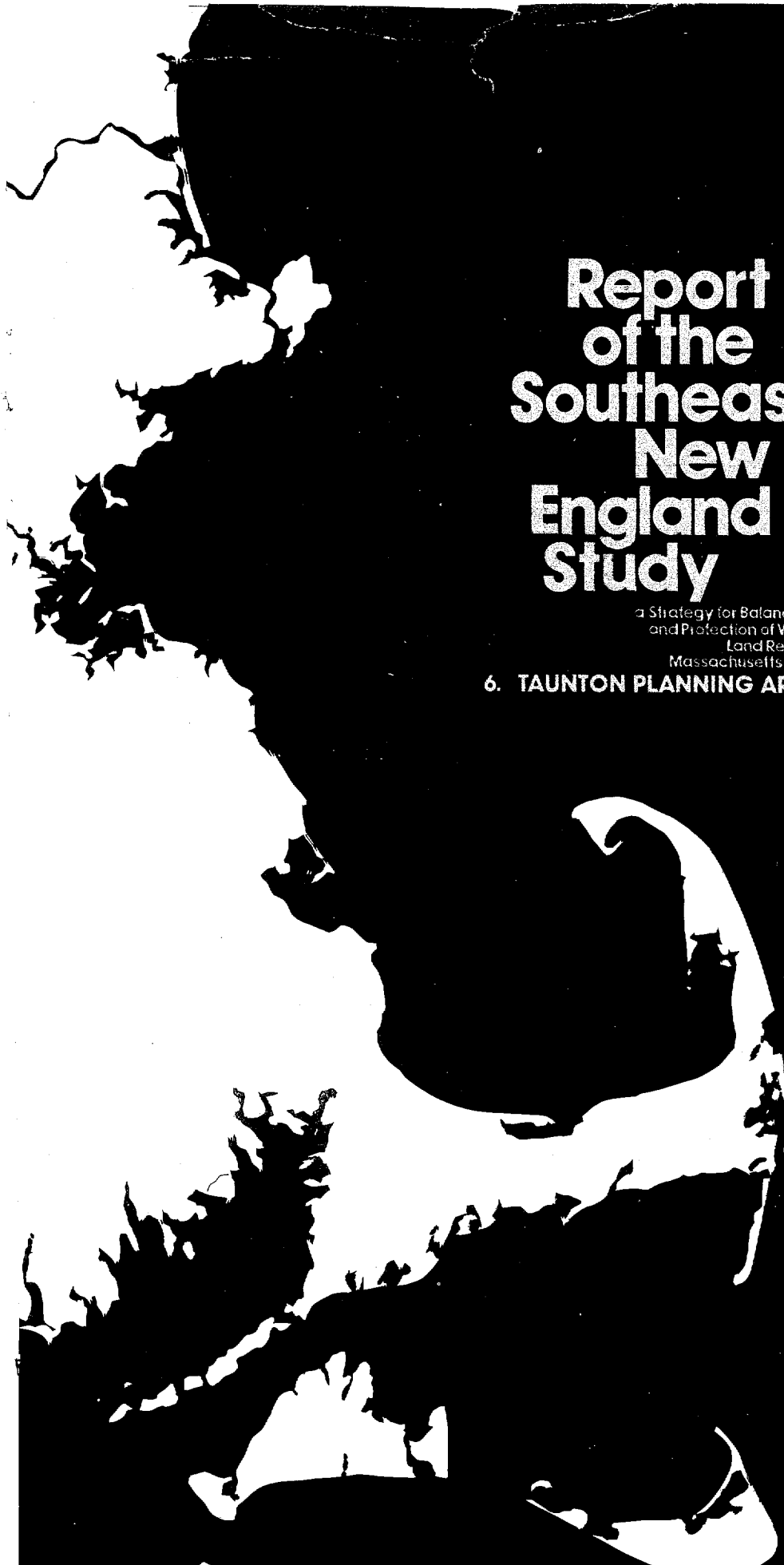
Copies of reports are available from:

New England River Basins Commission
55 Court Street
Boston, Massachusetts 02108

National Technical Information
Service
Springfield, Virginia 22151

and also in each of the 208 libraries and 210 town halls throughout the SENE region.





Report of the Southeastern New England Study

a Strategy for Balanced Development
and Protection of Water and Related
Land Resources in Eastern
Massachusetts and Rhode Island

6. TAUNTON PLANNING AREA REPORT

New England River Basins Commission
December, 1975

SUMMARY, REGIONAL REPORT
(with Environmental Statement), and
10 PLANNING AREA REPORTS

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDY

READER'S GUIDE: HOW TO REVIEW THIS REPORT

- In five minutes

FOR A "THUMBNAIL SKETCH"

Read the **OVERVIEW** which folds out as one large sheet. There is an extra copy in the pocket in the rear for those who would like to mount it on the wall.

- In a half hour or less

TO LEARN THE MAIN POINTS

Read the **SUMMARY**. It is published separately. You can read it in either of two ways:

- **SELECTIVELY**. Read the Chapters on Goals and Approach and Guiding Growth, plus any others that interest you. Chapters are boldly labeled to facilitate selective reading; or
- **ENTIRELY**. Read the full summary for a fuller understanding of the highlights of the SENE Study.

- In one day or less

TO UNDERSTAND THE DETAILS

Read the **REGIONAL REPORT**.

- **SELECTIVELY**. It is organized exactly like the summary. Wherever your interests lie, you can turn to those sections for additional background, amplifications, analysis of rejected alternatives, and especially for the full text of each recommendation, including who should do what and when. Also, remove the Development Capabilities Maps in the rear pocket and examine the legend to appreciate the type of information the maps portray; or
- **ENTIRELY**. Read the full report for full appreciation of all recommendations, and how they interrelate.

- In an additional 10 minutes to 2 hours

FOR APPLICATION TO YOUR AREA

Get the **PLANNING AREA REPORT** for your locale. Scan it or read it to see how the broader recommendations presented in the Regional Report may apply to the area where you live or work.

TABLE OF CONTENTS

6. Taunton Planning Area Report

| | |
|--|-----|
| OVERVIEW | v |
| PLANNING AREA ACTION MAP | vii |
| CHAPTER 1 THEMES | 1-1 |
| CHAPTER 2 THE SETTING | 2-1 |
| CHAPTER 3 GUIDING GROWTH | 3-1 |
| The Situation 3-1, Anticipated Growth 3-1, Accommodating Growth 3-2, Guiding Growth 3-3, The Solutions 3-6, Priorities 3-8, Implications 3-8, | |
| CHAPTER 4 WATER SUPPLY | 4-1 |
| The Situation 4-1, The Solutions 4-1, The Fall River System 4-1, The Somerset System 4-1, The Taunton System and Related Towns 4-3, Related Towns 4-3, The Brockton System and Related Communities 4-6, Communities Relying on Ground Water 4-6, | |
| CHAPTER 5 WATER QUALITY | 5-1 |
| The Situation 5-1, The Solutions 5-1, Restoration 5-1, Land Disposal 5-3, Preservation 5-3, Anti-degradation 5-3, Septic Systems 5-4, Sanitary Landfills 5-4, Stormwater 5-4, | |
| CHAPTER 6 OUTDOOR RECREATION | 6-1 |
| RECREATIONAL BOATING 6-1, The Situation 6-1, The Solutions 6-1, <i>Implications</i> 6-2, GENERAL OUTDOOR RECREATION 6-2, The Situation 6-2, The Solutions 6-3, <i>Implications</i> 6-4, WILDLIFE AND FISHERIES PRODUCTION 6-4, The Situation 6-4, The Solutions 6-5, | |
| CHAPTER 7 MARINE MANAGEMENT | 7-1 |
| URBAN WATERFRONTS 7-1, The Situation 7-1, The Solutions 7-2, | |
| CHAPTER 8 FLOODING AND EROSION | 8-1 |
| The Situation 8-1, Inland Flooding 8-1, <i>Flood Damages</i> 8-1, <i>Wetlands</i> 8-2, Inland Erosion 8-2, Tidal Flooding 8-2, The Solutions 8-3, Recommendations 8-3, Implications 8-4, | |
| CHAPTER 9 LOCATING KEY FACILITIES | 9-1 |
| PETROLEUM-RELATED INDUSTRIAL DEVELOPMENT 9-1, COAL MINING 9-2, | |

OVERVIEW

Taunton Planning Area

What is the point of the SENE Study program?

Balanced use and conservation of the region's water and related land resources is the program's objective. The Southeastern New England (SENE) Water and Related Land Resources Study was authorized and funded by Congress in response to the increasingly troublesome pressures the region's rapid urbanization was exerting on its rich and varied natural resources. The SENE Study has two major goals:

- To recommend actions for all levels of government and private interests to secure for the people of the region the full range of uses and benefits which may be provided by balanced use and conservation of the region's water and related lands.
- To assemble information on the resources at a consistent scale and level of detail.

What makes this Study different is that it covers a relatively large geographic area (4400 square miles), it addresses a full range of water and related land issues, and it proposes coordinated actions for all levels of government and private interests.

What does the SENE Study program cover?

The most important recommendations for this planning area include the following:

- (1) To accommodate growth in environmentally and economically acceptable ways, municipalities should prohibit or restrict development on Critical Environmental Areas such as wetlands, flood plains, and well sites. Growth should be guided to Developable Areas which cover 41 percent of the planning area. Within this category, municipalities should manage development on resources such as steep slopes, ledge, and soils with septic system limitations. Development should be encouraged where services already exist or are planned.
- (2) To supply sufficient amounts of water to the steadily increasing population of the Taunton planning area, communities are urged to protect ground water through land use controls wherever it is used as a source of supply. Water conservation measures should also be encouraged throughout the planning area. Moreover,

several additional municipalities should be served by the Taunton Water Department and should join a regional water system. Communities in the greater Brockton area should join in a regional water supply system.

- (3) To maintain or improve the quality of this planning area's waters, advanced treatment plants should be constructed and regional collection systems developed to serve high-density areas. Industrial discharges in the more heavily urbanized areas of Brockton, Taunton, and Fall River will have to be eliminated by connection to municipal treatment systems, by subsurface disposal methods, or by process changes.
- (4) To meet recreational needs in the Taunton planning area, inland recreational facilities must be increased. There is a significant opportunity to accomplish this by capitalizing on the area's extensive wetlands and wildlife habitats. Major stream and wetland systems in the Hockomock Swamp area could be protected and managed for canoeing, hunting, or fishing activities. The demand for swimming within this planning area cannot be met, and will have to be satisfied in adjacent coastal planning areas.

What will the program do?

If the recommended actions are carried out, most 1990 needs for water, sewers, electric power, and outdoor recreation could be met by making more efficient use of existing facilities, legal authorities, and institutional designs. Protection of Critical Environmental Areas will avoid potential dangers to life and property from flooding, erosion, and contamination of water quality and will provide highly productive greenbelts. As a result, new growth in this planning area can be accommodated without harming the high quality environment which attracted the growth in the first place.

You can take the first step in helping to carry out the actions by reading the recommendations in the SENE Study Regional and Planning Area Reports. Write your local planning and conservation officials to encourage them to use the SENE planning process when developing or implementing master plans, zoning ordinances such as flood plain and watershed protection, and other water and land use decisions.

RECOMMENDATIONS

GUIDING GROWTH (Chapter 3)

1. Protect priority Critical Environmental Areas.
2. Restrict development on other Critical Environmental Areas.
3. Manage growth on Developable Areas.
4. Use SENE resource development capability analysis to guide future growth.
5. Accommodate growth where services already exist.

WATER SUPPLY (Chapter 4)

1. Maintain Fall River's existing surface supplies.
2. Maintain Somerset's existing supplies.
3. Develop local ground water in Freetown.
4. Develop local ground water in Dighton and Raynham.
5. Develop local ground water in Foxborough, Mansfield, Norton, and Middleborough.
6. Expand Taunton water system to serve eight additional municipalities.
7. Expand Brockton water system to supply Avon's future needs.
8. Maintain private wells in Berkley and Plympton.
9. Develop additional ground water resources in six planning area municipalities.

WATER QUALITY (Chapter 5)

1. Expand the existing Brockton secondary facility to serve Avon and part of Abington.
2. Form the Rumford River Sewer District.
3. Form the Old Colony Water Pollution Abatement District.
4. Discharge Hanson's wastewater to an advanced treatment facility.
5. Expand and upgrade Middleborough's existing secondary treatment facility.
6. Upgrade Taunton's existing primary treatment facility.
7. Maintain the existing Somerset secondary treatment facility.
8. Expand and upgrade Fall River's existing primary facility to secondary.
9. Pursue detailed site investigations for local land application projects in six communities.
10. Enforce local subsurface disposal regulations.
11. Operate and locate landfills in accordance with sound sanitary landfill regulations.
12. Begin stormwater and wet-weather stream sampling.
13. Attenuate runoff from new urban developments.

OUTDOOR RECREATION (Chapter 6)

Recreational Boating

1. Form a state boating advisory committee to guide new marina development.

2. Supervise new boating expansion.
3. Consider dredging a 6-foot deep Taunton River channel.
4. Develop new boat ramps.

General Outdoor Recreation

5. Develop guidelines for planning low-intensity recreation on storage reservoir lands.
6. Designate the Taunton as a scenic river.
7. Acquire four new state natural areas.
8. Expand and develop camping and picnicking in state forests.
9. Use SENE Development Capabilities Map in planning open space.

Wildlife And Fisheries Production

10. Enforce wetlands legislation.
11. Acquire important wetland wildlife habitats.
12. Construct fishways on eleven rivers.
13. Maintain fishways on the Nemasket River.
14. Designate ponds ten acres and larger as Great Ponds.
15. Acquire access to ponds for fishing.

MARINE MANAGEMENT (Chapter 7)

Urban Waterfronts

1. Coordinate local waterfront planning and development.
2. Provide guidance and set criteria at the state level for priority waterfront uses.
3. Review and coordinate waterfront use.
4. Provide federal funding for state and local waterfront development plans.

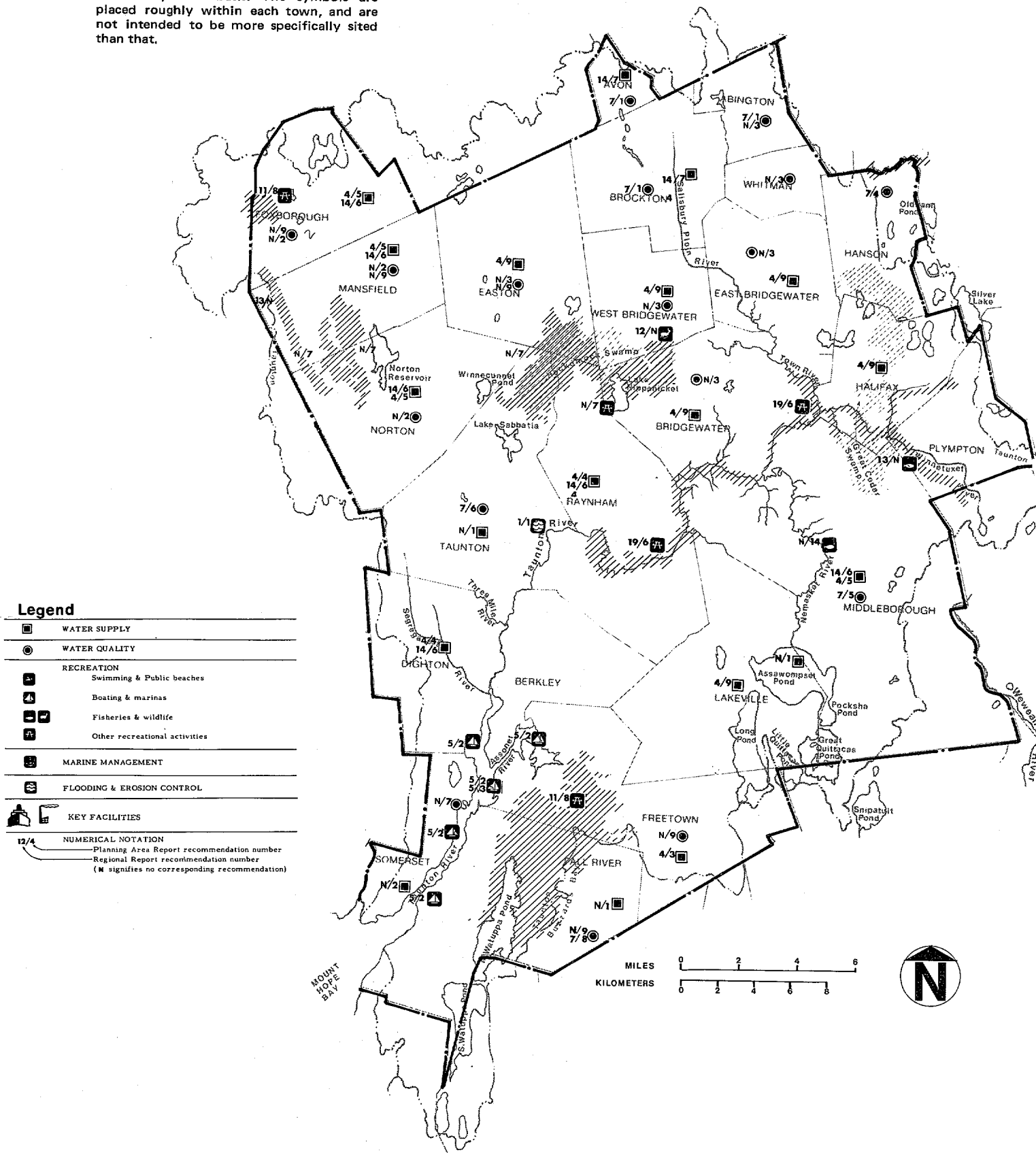
FLOODING AND EROSION (Chapter 8)

1. Develop a Taunton Basin flood plain management program.
2. Adopt local flood plain zoning preventing adverse flood plain development.
3. Establish local sediment and erosion control ordinances.
4. Establish forest buffer zones.
5. Acquire key wetlands and flood plains.
6. Locate in existing safe buildings in the flood plain.

LOCATING KEY FACILITIES (Chapter 9)

1. Fund coal deposit research.

The symbols on this map represent the recommended actions that can be shown on a town-by-town basis. The symbols are placed roughly within each town, and are not intended to be more specifically sited than that.



CHAPTER 1 THEMES

This report on the Taunton planning area is one of ten components of a comprehensive program for managing water and related resources in the Southeastern New England (SENE) region. The SENE Study's Regional Report has presented recommended policies and actions from a regionwide or statewide perspective. This Planning Area Report includes applications of those broad-based recommendations to the cities and towns of the Taunton area.

One reason for preparing planning area reports is to connect the actions at the local level with the policy framework and considerations for state and federal levels. Action recommendations are made to individual municipalities in keeping with the emphasis of the SENE Study for placing decision making at the level closest to the problem and in acknowledgement of the region's long history of local autonomy. The boundaries of the planning areas have been set along the town lines which most closely conform to the hydrologic boundaries of the drainage area.

The SENE Regional Report and each of the ten planning area reports are all linked by three overall themes:

- **Enhancing the environment enhances the economy.** The region's reputation as a pleasant place to live will have to be maintained in order to attract the highly skilled workers characteristic of a services economy.
- **Anticipated growth can be accommodated, but it needs guidance.** The rapidly growing communities in this planning area have special need to plan growth. Increased access from Routes 24, 25, and 140, coupled with existing and potentially expanded rail and transit service to the northern towns, will serve to maintain or increase pressures for growth and development.
- **Existing knowledge, programs, and institutions provide the most realistic tools for achieving results but some changes are needed.** Full use of ongoing programs, with some changes in how they relate to each other, was viewed as a way of "piggy backing" on programs which have already weathered most of the realities of the political process. In choosing this strategy, the Study traded off novelty to increase achievability.

Each major chapter in this Planning Area Report suggests actions which ought to be taken in order to solve problems

with continued growth or resource protection. Some of these problems are immediate, while others may not surface until after 1990, or in some cases, the next century.

The intensity of these various problems is set out in Table 1.1, which compares the severity of a given problem for each planning area, and for the region as a whole.

Of the seven problem areas studied, four were severe or major issues affecting the municipalities of the Taunton planning area:

- **Guiding Growth.** While this is one of the less-rapidly growing of the ten SENE planning areas, communities should nonetheless develop plans and actively protect their critical environmental resources from incompatible development.
- **Water Supply.** If the area's rate of growth continues, some municipal water supplies will be inadequate. Other communities, by maximizing local surface water supplies and, more importantly, their ground water supplies, will be able to meet their demands through 1990.
- **Water Quality.** There are major problems with municipal and industrial discharges, especially into low-flow waters which cannot assimilate the volumes of waste without posing health hazards. Septic systems are in widespread use throughout the planning area, and where used in higher densities, have created potential threats to ground water quality.
- **Recreation.** Demands for swimming facilities cannot adequately be handled by the few existing beaches within the planning area. As a result, beaches at ponds and lakes in this area are often filled to capacity and parking areas overcrowded. Extensive inland wetlands (about 60,000 acres) and many streams and ponds could be better utilized for extensive recreation activities.

Other significant problems in the planning area center on better control of urban runoff, agricultural runoff, and urban flooding.

TABLE 1.1 GENERAL INTENSITY OF SENE WATER - RELATED PROBLEMS BY PLANNING AREA

[illegible]

CHAPTER 2 THE SETTING

The Taunton River basin planning area lies just south and slightly west of the Boston Metropolitan area within the state of Massachusetts. The 23 cities and towns which comprise the area cover approximately 522 square miles (351,000 acres) of generally flat and very wet land. Most of the planning area's usable land lies less than 20 feet above its surrounding inland wetlands and flood plains. The 23 municipalities in the Taunton planning area are as follows:

| | | | |
|-------------|------------------|---------------|------------------|
| Abington | East Bridgewater | Hanson | Raynham |
| Avon | Easton | Lakeville | Somerset |
| Berkley | Fall River | Mansfield | Taunton |
| Bridgewater | Foxboro | Middleborough | West Bridgewater |
| Brockton | Freetown | Norton | Whitman |
| Dighton | Halifax | Plympton | |

Principal drainage of the basin is provided by the Taunton River and its tributaries. Originating at the confluence of the Town and Matfield Rivers in Bridgewater, the Taunton River flows southwest for 38 miles to Mount Hope Bay which is the northeast arm of Narragansett Bay. Six additional tributaries to the Taunton are the Winnetuxet, Nemasquet, Mill, Three Mile, Assonet-Cedar Swamp, and Quequechan Rivers.

The Taunton and its tributaries flow through a broad and very complex network of inland wetlands, one of which, Hockomock Swamp, is the state's largest. In addition to these 60,000 acres of wetland, numerous lakes and ponds also provide excellent wildlife habitat and natural valley flood storage areas. Much land in the Taunton basin is devoted to truck farms, cranberry bogs, and small dairy farms.

The shoreline of the Taunton River estuary and upper Mount Hope Bay is about 62 miles long. Over a third of this length is composed of tidal marshes, with much of the remainder divided between stony, narrow beaches backed by abandoned farm fields, or the heavily-developed waterfront of the City of Fall River. Less than 1.5 miles of sandy beaches exist along this part of the estuary. Because of its protected nature at the head of Narragansett Bay, the area does not suffer all of the severe effects of coastal hurricanes or winter storms which batter those portions of the SENE coastline along the ocean itself.

Most major industrial and municipal wastewater discharges in the Taunton planning area are inadequately treated and therefore pose significant water quality problems, especially in Fall River, Brockton, and Taunton. Combined sewer overflows in Taunton and Fall River further aggravate the problem.

Ground water represents the main source of water supply for about one third of the Taunton planning area's population. Many of these people have their own private wells as a source. The development of additional ground water sources in several municipalities will satisfy their 1990 demands, although additional supplies may be necessary beyond this date. The remainder of the area's population is served by surface sources.

The population of the Taunton planning area was about 399,100 in 1970, or 8 percent of the total population of Southeastern New England (fourth largest population of the ten SENE planning areas). In terms of absolute population growth, the Taunton planning area was sixth of the SENE region's ten planning areas for the 1960-1970 period. Although its growth rate for that ten-year period was about equal to that of the overall SENE region, it was less than the national growth rate of 12 percent, and was less than one-sixth of the 51 percent rate of growth experienced by the South Shore, which was the region's fastest-growing area. This relative standing is expected to continue through 1990.

Study projections indicate that population of the Taunton planning area could climb by another 28 percent to 512,000 by 1990. This is still the sixth-fastest rate expected in the region. The Taunton planning area's density of 1.14 people per acre is a slightly lower than the 1.68 average for the SENE region, and it ranks as the fifth most densely populated area in the region.

In 1970, there were 130,000 persons working in the planning area. In absolute size it was the fourth largest employment center in the region. The absolute growth in employment during the sixties of 21,000 gave it the third largest increase in number of jobs among all ten basin planning areas. As a result, nearly one of every 12 jobs in the region was located in the basin. Of those new planning area jobs, one out of every four occurred in retail activities, with 40 percent of those located in Brockton, due in large part to the development of a major shopping center. Population increase within the area resulted in demands for more public services, such as utilities, medical facilities, private education, architect-engineering, and research and development operations — which accounted for one out of every three new jobs in the basin. Government employment also accounted for more than one of three new jobs. Manufacturing employment, by contrast, declined by about 2,400 or 4.8 percent. Nevertheless, the manufacturing sector, with 50,354 jobs in 1970, was the single most important economic sector in the Taunton planning area, accounting for as many as one in every 2.6 jobs, overall.

Per capita income of people employed within the Greater Boston and Fall River-New Bedford economic subareas averaged \$3370 in 1967 dollars. This is somewhat lower than the SENE-wide average of roughly \$3700 and is only slightly lower than the national per capita average of \$3435. These figures, however, are only averages which are useful in giving a relative order of magnitude of people employed within the economic subareas and are not meant to accurately represent the average real income of area residents.

Early in the Study, participants at a workshop held in the Taunton planning area indicated strong support for creating regional water supply systems within the basin as well as emphasizing water conservation measures to limit the rate of growth in per capita consumption of water. They also preferred a system of wastewater treatment plants servicing the region, some of them advanced-stage plants, with land discharge of treated wastewaters wherever possible. For wetlands protection, they endorsed technical assistance from regional planning agencies for better intertown protection, supplemented with public purchase. To enhance recreational opportunities, strong support was given to expanding existing facilities and purchasing new acreage for more extensive use.

Later during the 90-day review period, over 275 state, regional, and municipal officials, federal agencies, and concerned citizens submitted comments on the Study's draft reports. The major comments are summarized in a Regional Report chapter, "*Review of the Report.*"

There were several noteworthy changes in the Taunton Planning Area Report as the result of 90-day review. *Chapter 4* has a new recommendation to supplement the Brockton water system by diverting flood flows from the Howard and Pines Brooks and the Jones River. The draft recommendation — to meet Brockton's needs by joining the Abington-Rockland system with the Brockton system — has been dropped from *Chapter 4* due to new information and the preferences of officials in Abington and Rockland and regional planning officials. In response to concerns of Trout Unlimited and residents, the problems of thermal discharges to the Taunton River and pollution from highway deicing salts were brought out in *Chapter 5*. To emphasize the high quality fisheries, wildlife, and estuarine resources in *Chapter 6*, low flow management in the Segregansett and Jones Rivers was suggested as well as the need to protect marine resources from excessive boating development.

Several implications can be extracted from the existing situation:

- (1) The nearly 60,000 acres of inland wetlands in this planning area have been primarily responsible for preventing damaging floods. However, these natural valley storage areas are under considerable

development pressure. Careful consideration should be given to all land use development proposals which could adversely impact these functions.

- (2) The Taunton planning area experienced a rate of growth slightly less than that of the overall SENE region, and this rate is expected to continue. Opportunities exist for positive action to better control this growth, ensuring its proper location in order to protect critical resources while ensuring economic development.
- (3) The emphasis on manufacturing indicates continuation of present problems with industrial discharges to the planning area's waterways. Emphasis will have to be placed upon enforcing workable effluent controls to reduce potential water pollution.
- (4) Although the Taunton planning area has more surface water than any other Massachusetts planning area, several of the larger water bodies are reservoirs, and thus inaccessible for public use. If some of the land around these areas were opened to "extensive" outdoor recreation (e.g., hiking, nature study, etc.) more of the planning area's recreational needs could be met.
- (5) The Taunton River has the potential to provide for many types of recreation if its water quality can be improved. Camping, picnicking, and canoeing along the river corridor, as well as boating in the Taunton estuary are potential recreational activities for residents of the Taunton and adjacent planning areas.
- (6) Over 81 percent of the Taunton planning area is composed of forests, fields, wetlands, or open waters. These resources provide major opportunities for outdoor recreation, not only for the residents of the area, but for the urban populations of adjacent planning areas as well. This area's most pressing recreation shortages in the future will be in camping, hunting, and fishing opportunities, much of which, although currently satisfied by the existing resources, could be met by proper resource management and development programs.

CHAPTER 3 GUIDING GROWTH

Between 1960 and 1970, the Taunton planning area's population growth produced a 60 percent increase in urbanized areas from roughly 40,000 acres in 1960 to about 62,000 acres in 1970. This growth, although lower than the SENE average, has put increasing pressure on water and related lands critical to the area's well-being. The Taunton area contains the largest amount of such Critical Environmental Areas of all ten SENE planning areas. Some 69 percent of the planning area is made up of forested or open lands and water resources (though all of these are not critical resources). Urban uses now account for 18 percent of the area, and agricultural lands make up the other 13 percent of the planning area's 351,000 land and water acres.

Population growth is projected to continue in the next fifty years at a very slowly declining rate, bringing a population in 2020 which is 75 percent higher than the 1975 figure.

There is growing concern among the planning area's residents about finding ways to locate new development where it will lessen the impact on the area's land and water resources. *Chapter 2 of the Regional Report* has shown these resources to be components of an environmental quality which is an important factor in the region's economic vitality. In this planning area, if certain steps are taken, anticipated growth can be accommodated while maintaining the existing quality of life. This chapter describes the nature of the expected growth and the ability of the resources to accommodate new development. It concludes with strategies recommended to guide growth which are sensitive to both economic and environmental considerations.

The Situation

Anticipated Growth

The Taunton planning area is large, containing the fourth greatest area and population in the SENE region. In spite of cities such as Fall River, Brockton, and Taunton, a relatively low proportion of the area is urbanized (18 percent as opposed to the SENE average of 21 percent). Sixty percent of the planning area is in forest (including forested wetlands), 13 percent is agricultural, and four percent is in other non-urban uses, leaving five percent in water. In the urban areas, about 60 percent of the land is in high intensity use (commercial, residential of multi-family or single family units on less than half-acre lots, or institutions). Medium intensity residential uses (half-acre to one-acre lots) occupy about 20 percent of the area. The remaining urban area is nearly evenly divided among industrial, transportation, extraction/disposal, and low intensity residential use (lots greater than one acre).

The population growth rate between 1960 and 1970 (17 percent) was slower than the average rate of the planning areas, and consumed land at a lower rate (approximately 0.4 acres per person) than the SENE average of one-half acre per person. But this consumption of land has, in the past decade, decreased the agricultural land available by almost 30 percent, all but eliminated the few remaining coastal wetlands, and made substantial inroads into the inland wetlands of the area.

TABLE 3.1 MUNICIPALITY BY DEVELOPMENT PRESSURE: TAUNTON PLANNING AREA

| High | Medium-High | Medium-Low | Low |
|------------------|-------------|---------------|------------|
| Avon | Abington | Bridgewater | Berkley |
| Brockton | Freetown | Dighton | Fall River |
| East Bridgewater | Halifax | Mansfield | |
| Easton | Hanson | Middleborough | |
| Foxborough | Norton | Whitman | |
| Lakeville | Plympton | | |
| Raynham | Taunton | | |
| Somerset | | | |
| West Bridgewater | | | |

Note: Based on information available to the Southeastern Regional Planning and Economic Development District (SRPEDD), Lakeville, Raynham, and Somerset might have lower pressure, and Mansfield, Berkley, and Fall River higher pressure, than indicated above.

The population of the Taunton planning area is expected to grow by 28 percent by 1990, and by a total of 76 percent by 2020. Assuming that existing rates of land consumption will apply to these population increases, approximately 43,000 acres could be needed to accommodate the additional population by 1990, and a total of 115,000 acres would be necessary by 2020. This last figure is still lower than the 129,000 acres of developable C, F, and G lands in the planning area (see Table 3.6, *Regional Report*). However, growth must be guided to these developable lands to ensure that critical environmental resources are protected.

The rates at which parts of the planning area will be urbanized will vary to some extent with relative development pressures. These pressures were estimated for SENE communities on the basis of a formula using factors such as the rate of growth of residential, commercial and other

uses, the relative accessibility of an area to employment and population in other parts of the region, and the availability of easily developable land. The precise process for grouping towns by development pressure is defined in *Chapter 3 in the Regional Report*. While use of other factors, such as recent building permits or land consumption rates, may produce different results, combining the factors used gives a useful indication of development pressure in the communities in the planning area, relative to all SENE communities (see Table 3.1).

Accommodating Growth

If the 275,000 non-urban acres were to be urbanized indiscriminately, serious problems could result in the planning area. About 150,000 of these 275,000 acres have been identified as being significant for protecting water

TABLE 3.2 THE SENE RESOURCE DEVELOPMENT CAPABILITY SYSTEM

CRITICAL ENVIRONMENTAL AREAS REQUIRING PROTECTION

Water Bodies (Category A), blue. [Includes estuaries, shellfish flats, and fish spawning areas.]

Priority Protection Areas (Category A), dark green: wetlands, well sites, beaches, and critical coastal erosion areas.

Other Protection Areas (Category B), light green: flood plains, class I and II agricultural soils, unique natural and cultural sites, [proposed reservoir sites and related watersheds, and upland erosion areas] excluding all "A" areas.

DEVELOPABLE AREAS REQUIRING MANAGEMENT, Excluding All A & B Areas

WATER RESOURCE LIMITATIONS

Aquifers and/or Recharge Areas (Category C₁) black dots: highest yield aquifers in each basin.

WILDLIFE AND SCENIC RESOURCE LIMITATIONS

Wildlife Habitat (Category C₃), black diagonal lines: best upland wildlife habitat other than publicly owned land and [commercial fishing grounds].

Landscape Quality Areas (Category C₂), black vertical lines: land characterized by high landscape quality other than categories C₁ and C₃.

SOILS RESOURCE LIMITATIONS

Ledge and/or Steep Slope (Category C₅), brown: land with slope greater than 15 percent and/or with rock near the surface.

Severe Septic System Limitations (Category C₄), orange: land with severe septic system limitations other than Category C₅.

Moderate to No Septic System Limitations (Categories F and G), yellow: land with moderate or no septic system limitations.

PREEMPTED USE AREAS

Urban Areas (Category E), gray: residential^{5/} institutional, commercial and industrial development.

Publicly Owned Lands (Category D), beige: major public parks, forests, watersheds, and military lands.

Notes:

- ^{1/} All categories above, except those within brackets, are depicted on the development capabilities maps (plates 1, 2, 3).
- ^{2/} Categories in brackets are included to show where they would fit in the overall classification hierarchy, were they included on the plates in the pocket.
- ^{3/} All categories above, including those within brackets, are depicted on large-scale, unpublished maps available for inspection as part of the SENE Files.
- ^{4/} Categories C₁, C₂ and C₃ overlap with categories C₄, C₅, F, or G. Thus, Category C₃-C₄ is a wildlife habitat located on ledge or steep slopes.
- ^{5/} Mapped urban areas (Category E) include all-residential development, although the legend on Plates 1, 2, and 3 reads "residential areas on less than one acre lots."

related land resources and sensitive to destruction by urban development. These are areas which the Study has classified as **Critical Environmental Areas**, listed on Table 3.2 and mapped on Plate 2, Development Capabilities Map.

The most fragile and valuable of these are **Priority Protection Areas (Category A)** in which any development threatens public health, safety, and welfare: water bodies, wetlands, well sites, beaches, critical erosion areas, estuaries, shellfish flats, and fish spawning areas. (only the first three are found in significant amounts.) Priority protection areas cover about 19 percent of this planning area. Water bodies in the planning area need protection by land use measures from non-point source pollution. Polluted urban runoff and agricultural runoff are harming water quality of the many lakes, ponds, and streams of the planning area. This river basin contains the largest amount of wetlands, but their loss through development is increasing urban flooding and other problems. *Chapters 6 and 8 of this and the Regional Report* discuss the value of wetlands for flood storage, ground water, plant and wildlife habitat, water quality and other purposes.

Other Protection Areas (Category B) which can retain their usefulness only under certain limited kinds of development are: flood plains, prime agricultural soils, unique natural and cultural sites, proposed reservoir sites, and upland erosion areas. Resources in this category not already included as A resources, cover 22 percent of the planning area. This planning area contains 33,000 acres of flood plains, the third largest amount of all planning areas. In some areas, extensive development in these flood plains has aggravated flooding problems (*see Chapter 8 in this report*). Prime agricultural lands are relatively abundant in the central portions of the basin, but are targets for development. The *Regional Report, Chapter 3*, discusses the significance of the loss of these areas and methods of protection. *Unique cultural sites* are found in greatest abundance in Dighton and Somerset. The entire Taunton River basin has a high incidence of archaeological sites, especially along the Nemasket River. Creation of a reservoir to serve the Taunton system's post-1990 needs may be required as discussed in *Chapter 4 in this report*; development of areas likely to become reservoirs, or their immediate watershed areas, not only multiplies the cost of acquisition, but causes potential pollution problems.

The remaining undeveloped areas, comprising 129,000 acres (37 percent of the planning area), must be managed with varying degrees of regulation to protect certain values. These have been mapped on Plate 2 as **Developable Areas (Categories C, F, and G)** and include: ground water recharge areas, best upland wildlife habitat, high landscape quality areas, ledge and steep slopes, severe septic system limitation (Category C), and moderate to no septic system limitations (Categories F and G).

Small, scattered portions of the planning area are underlain by high yield aquifers, upon which a number of communities and many individuals are dependent for their water supply. Their recharge areas should be protected from pollution and from depletion caused by nonpermeable coverage or installation of sewers. The largest concentration of upland wildlife habitat occurs in northern Taunton, Raynham, and Bridgewater and southern West Bridgewater, and Easton. Areas of high landscape quality, defined by land use diversity and relief, are plentiful in a band along the Taunton River and in areas of Freetown, Lakeville, and Middleborough. The second largest acreage of soils with severe septic system limitations is in this planning area. These are scattered throughout, but the largest portions are in the northeast portion of the planning area (from Middleborough to Holbrook) and west of the Taunton River (Dighton and surrounding towns). Density of development on those soils must be regulated according to availability of sewers. Areas of ledge (exposed or within three feet of the surface) offer little development potential. Development on slopes of over 15 percent can cause risk of erosion and septic system seepage to areas below.

Large areas of land are unavailable for development because they are **Preempted Use Areas** in *public ownership (Category D)*. Most of the public lands are in open space recreation, or water supply related use. Approximately four percent of the Taunton planning area is in public ownership. Finally, as mentioned earlier, about 18 percent of the planning area has already been *urbanized (Category E)*. Much of this area, though served by sufficient infrastructure, such as water, sewer, and roads, remains vacant, and could be available for additional development if problems preventing that development were overcome. It is worth noting that some developed areas can be used — and further, that use and reuse of such land can be highly efficient.

Guiding Growth

The relative amounts of Critical Environmental Areas in Categories A and B, developable lands in Categories C, F, and G, and developed or preempted Categories D and E, are displayed for the ten SENE planning areas on Table 3.3 Table 3.4 presents suggested guidelines for the suitable uses of Developable Areas mapped on Plate 2. The proportion of the planning area in Category A and B lands is the highest of all SENE planning areas (41 percent). But a fairly low proportion of land is already preempted by development or by public ownership (22 percent); only two planning areas have lower proportions. As a result, the proportion of developable lands (37 percent) is about average for the region.

If the development which accommodated the population projected for this planning area were to be restricted entirely to the "Developable Areas Requiring Management",

and land were consumed at the average rate for the SENE region, the land available would easily support the 1990 population, but not the 2020 population. During the late 1960's, the land consumption rate for the Taunton planning area was just under 0.4 acres for each additional person, a lower figure than the regional average of 0.5 acres per additional person. Assuming that the same rate of land consumption (0.4 acres per additional person) will hold for the future, 322,500 persons could be accommodated on the planning areas C, F, and G lands. This is more than the anticipated increase of 113,000 people by 1990, but only slightly higher than the projected increase of 304,000 people by 2020. Should the land consumption be at the regional rate (0.5 acres per additional person), only approximately 258,000 persons could be accommodated, a figure lower than projected 2020 population increases.

In addition to the land use problems facing the planning area due to resource capabilities of certain areas, there are problems in siting certain kinds of key facilities and developments. A number of uses are vital for the economic growth of the region or the planning area, or to service the needs of the population, but which have significant impacts on water supply or quality. These facilities should not be located in Critical Environmental Areas, and their particular location within Developable Areas should be determined in accordance with carefully considered criteria.

Demand for power is steadily growing, but few sites exist that meet requirements for power plants with minimal degradation of the environment or safety hazards. Such development would have enormous consequences in land and water utilization. The consequences of these facilities are discussed further in *Locating Key Facilities, Chapter 9*. Similar considerations apply to such things as solid waste disposal and large scale development.

Transportation systems are among the facilities with large scale impact, both in their use of resources and in their influence on development patterns. Existing and proposed transportation systems have been mapped for the SENE region. These highways may, in various places, conflict with A and B resources, and compete with other uses for C, F, and G resources. For example, the Route 495 extension connecting with Route 25 is planned to cross through an edge of Hockomock Swamp, run through other smaller wetlands, and cross areas of substantial potential ground water supplies.



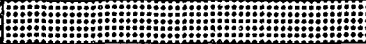
Hockomock Swamp serves as a natural flood storage area. During the summer months, this wetland provides a controlled release of water into the Taunton River which assures adequate flow and levels of water in the lower reaches of the river. A number of local well sites are located around the periphery of the swamp, which could be contaminated

TABLE 3.3 PERCENT OF LAND AND WATER RESOURCE CATEGORIES IN EACH PLANNING AREA

| Planning Area | Total (in 1000's of acres) | Percent (%) of Planning Area | | | | |
|-----------------------|----------------------------------|---------------------------------|-----|-------|------------------------|------------------------|
| | | Critical Environmental Areas | | | Develop- able Areas | Preempted Use Areas |
| | | A | B | A & B | C, F, G | D, E |
| Ipswich-North Shore | 274 | 19 | 13 | 32 | 34 | 34 |
| Boston Metropolitan | 421 | 14 | 9 | 23 | 30 | 47 |
| South Shore | 172 | 17 | 13 | 30 | 43 | 27 |
| Cape Cod & Islands | 378 | 10 | 23 | 33 | 32 | 35 |
| Buzzards Bay | 205 | 17 | 16 | 33 | 47 | 20 |
| Taunton | 351 | 19 | 22 | 41 | 37 | 22 |
| Blackstone & Vicinity | 410 | 10 | 11 | 21 | 38 | 41 |
| Pawtuxet | 180 | 11 | 7 | 18 | 41 | 41 |
| Narragansett Bay | 212 | 16 | 16 | 32 | 34 | 34 |
| Pawcatuck | 262 | 27 | 12 | 39 | 40 | 21 |
| SENE | 2,865 | 16% | 15% | 31% | 36% | 33% |

Sources: See Methodology in the Regional Report.

TABLE 3.4 SUGGESTED* GUIDELINES FOR USE OF DEVELOPABLE AREAS SHOWN ON PLATES 1, 2, and 3

| MAP COLOR | MAP PATTERN | NONE (color only) |  |  |  |
|-----------|---|---|---|---|---|
| | Other Resource Limitations Soils Limitations | No other Resource Limitations | High Landscape Quality (Category C ₂) | Upland Wildlife Habitat (Category C ₃) | Aquifer and/or Ground water recharge areas (Category C ₁) |
| YELLOW | Moderate to No Limitations for septic system disposal (Category F & G) | - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU | If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.0 ac/DU | If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.5 ac/DU | If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Med. Intensity I/C . At least 1/2 ac/DU Unclustered or no PW & PS - . No I/C . At least 3 ac/DU** |
| ORANGE | Severe septic system limitations caused by conditions other than slope and ledge soils (Category C ₄) | - PW & PS . Any I/C . Any Res. - PW only . Low Intensity I/C . At least 1.5 ac/DU | If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU | If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU | If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PS only . Med. Intensity I/C . At least 1/2 ac/DU - PW only . No I/C . At least 3 ac/DU |
| BROWN | Ledge and/or steep slope greater than 15% (Category C ₅) | - PW & PS . No I/C . At least 1/2 ac/DU *** - PW only . No I/C . At least 2 ac/DU | . No I/C . At least 3 ac/DU | . No I/C . At least 3 ac/DU | . No I/C . At least 3 ac/DU |

* These are designed to provide a framework for designing guidelines of increasing specificity by state, regional, and local planners, and consultants more intimately knowledgeable with local circumstances.

** In many cases suggested guidelines for development, particularly for ground water, are estimates of probable safe controls made in the absence of greater knowledge of the effects of development on the pollution of aquifers.

*** Erosion control measures should accompany other restrictions on slopes over 15%.

Med. & Low Intensity - refers to water use/effluent discharge/building coverage

Clustering - refers to percent impermeable land surface area which may adversely effect the resource.

PW - Public Water Supply System

Res. - Residential

PS - Public Sewer System

ac - acre

I/C - Industry/Commercial

DU - Dwelling Unit

by highway salts. Hockomock also is the largest inland breeding area for water fowl and other wildlife. It is a source of sports game for the thousands of hunters who live not only in the planning area, but in adjacent planning areas as well. Ponds adjacent to the Swamp provide much-needed fresh water swimming opportunities. The entire complex of swamp and ponds has been designated by the SENE Study as a major recreation area, based upon State Comprehensive Outdoor Recreation Plans. The proposed road and interchanges not only threaten the flood storage, recreation, and water supply functions of the Swamp, but pose high prospects of induced development as well. There are already localized problems of erosion, siltation, and contamination from septic systems caused by existing development. Further development could well compound these problems.

If the highway is to be constructed, the greatest care must be exercised in the location of the interchanges. They are the largest source of induced development, and increase the area of highway salt pollution. Of the presently proposed locations, one at the intersection of Route 495 and Bay Road would be a hazard to the numerous wells and lakes and ponds in the area. The State Department of Public Works has adjusted its highway alignments to find the best solutions given regional considerations.

About 35 percent of the planning area's population is served by sewers. Proposals for additional sewer facilities would serve about 122,000 people in addition to those presently served or living on parcels which will probably need service (under one-half acre). This is almost half the additional population projected for the planning area by 2020. Encouraging development in areas where infrastructure — not only sewers, but also water and transportation service — already exists, or is planned, would increase its efficient use and decrease the necessity of additional investment. Clustering development is in itself more efficient, economically and environmentally (see *Chapter 3, Regional Report*). Greater concentration also increases the feasibility of rail and mass transit systems which are more efficient in use of land, energy, and air resources, and reduces water pollution from highway salt. Investment policies for new infrastructure which inevitably influence the location, speed, type and intensity of development should be coordinated with growth policies at all levels of government.

The Solutions

To take advantage of the Taunton planning area's potential for accommodating growth without significantly changing the overall environmental quality, the following program is recommended: (a) Protect Category A, Critical Environmental Areas; (b) Restrict Development on Category B, Critical Environmental Areas; (c) Manage develop-

ment of Categories C, F, and G, Developable Areas, while guiding growth to areas with existing infrastructure.

A number of methods are available to carry out this program: existing legislation, zoning, subdivision regulations, building codes, acquisition of fee simple, easements, or development rights. Within the context of existing methods, the actions below are recommended for municipalities, with the assistance of the Departments of Community Affairs and Environmental Management and the regional planning agencies. Technical and financial assistance should be provided to review and adjust plans, ordinances, and bylaws, ensuring their compatibility with the following recommendations:

1. **Protect priority Critical Environmental Areas.** Municipalities should prohibit development on Category A, Critical Environmental Areas (Priority Protection Areas). The appropriate uses of these resources include: water supply, fisheries and shell fish production, limited recreation, and scenic or open space lands.

Local planning and zoning boards should protect water bodies from pollution by restricting adjacent development and by enacting subdivision regulations requiring storm water runoff detention ponds. The recommendations in *Chapter 5 of this report* will also help to achieve the state's water quality standards. Wetlands should be protected through more rigorous enforcement of existing legislation at a local and state level (*Chapter 8 of the Regional Report details how the legislation can be improved; Chapter 6 of the Regional Report discusses kinds of assistance available to municipalities*). Municipalities, using Massachusetts Self-Help Funds, and/or private interests, such as Massachusetts Audubon and Trustees of Reservations, should acquire the most valuable wildlife wetlands and surrounding uplands which are described in *Chapter 6 of this report*.

A similar recommendation is made for the management of Category B Critical Environmental Areas needing protection:

2. **Restrict development on Other Critical Environmental Areas.** Municipalities should restrict development on Category B Critical Environmental Areas (Other Protection Areas). Suitable uses to be considered for this category should include agriculture, extensive recreation, forestry, or, in some cases, with proper management, very low density residential use.

Measures for protecting flood plains, described in depth in *Chapter 8 of the Regional Report*, include local flood plain zoning which prohibits adverse development, discouraging or prohibiting reconstruction after substantial storm damages,

and relocating some public facilities if structural protection is not available or practical. Structural methods required to remedy flooding problems in this planning area are described in *Chapter 8 of this report*. **Prime agricultural lands** should be protected by legislation enabling tax incentives and agricultural districts, and by funding for acquisition of development rights for the highest priority lands. (*see Regional Report, Chapter 3, for more details*). **Proposed reservoir sites and unique natural and cultural sites** should be protected by acquisition of fee simple, easements, or development rights. *Chapter 4 of this report* describes water supply recommendations. **Upland erosion areas** should be protected by local sediment and erosion control ordinances (*discussed in Chapter 8 of the Regional Report*).

3. Manage growth on Developable Areas.

Municipalities should manage growth on Category C resources and encourage growth on Category F and G resources, especially where infrastructure exists or is planned.

It is worth noting that this recommendation deals with management of all developable areas, both within existing developed areas, and in areas yet to be developed; there are no developable areas in which management of some kind is not required.

On **ground water recharge areas**, housing density should be restricted so that septic systems will not endanger water quality. Densities requiring sewers should be allowed only after analysis of the economic and environmental feasibility of recharge maintenance techniques to prevent depletion of the aquifer (*see Chapter 4, Water Supply and Chapter 5, Water Quality, of the Regional Report*). For details about suitable uses of these lands, refer to Table 3.4. Other ordinances and building codes should control coverage by impermeable surfaces, require stormwater detention ponds to return runoff to ground water from roofs, streets, parking lots, and driveways. Regulations and sound engineering practices should be used to minimize the effects of activities hazardous to ground water quality such as sanitary landfill operation, highway deicing salt storage, industrial waste disposal, agricultural runoff, and sand and gravel mining below the water table. On areas with **high landscape quality, best upland wildlife habitats**, and on **unsewered soils with severe septic system limitations**, only development at very low density or in clusters should be allowed. Development that would tend to preempt the resource value of wildlife habitat and landscape quality should be carefully evaluated to ensure that adverse impacts are fully taken into account. **Steep slopes** should be protected from erosion by low density use. Development on **moderate limitation areas** should be regulated to correspond to the availability of sewers. Higher densities should be encouraged on F and G lands, as many C lands can support only very limited densities.

Although local governments have much of the authority

necessary to implement the concept of guiding growth based on resource capability, its implementation will be most effective if adopted as a matter of state policy. Many of the resources of concern extend beyond town boundaries, and greater funds and information exist at the state level.

The most expeditious way for the state to implement these concepts would be for the state interagency policy council to review and adopt, as appropriate, the policy issues suggested herein.

Massachusetts should continue to progress towards developing a comprehensive policy for guiding growth. This decision is most appropriately made by an existing interdisciplinary organization; it is therefore recommended that the Commonwealth of Massachusetts:

4. Use SENE resource development capability analysis to guide future growth.

The Massachusetts Cabinet, with the active participation of regional planning agencies and municipal government, should review and use the SENE Study's resource development capability analysis to develop a policy for guiding future growth. Guidelines can be developed at the state, substate, regional, or local levels of government (*see Chapter 10 of the SENE Regional Report*).

Chapter 3 in the Regional Report describes the economic inefficiencies and environmental costs of urban sprawl. Making better use of roads, sewer systems, and water supply systems, where they already exist, could help to avert those costs. Therefore, it is recommended that policies be developed to:

5. Accommodate growth where services already exist.

The Massachusetts Cabinet, in conjunction with towns, regional planning agencies, and state agencies, should establish policies to accommodate further development in already developed areas, and to permit maximum use of existing water, sewer, and transportation services. Planned unit development and the cluster principle should also be encouraged in these areas.

The Regional Report also recommends establishment of a system for determining criteria for locations of developments of regional impact. This would be within the framework of the system designed to protect critical areas and manage others, and would enable consideration of environmental and economic justification of siting decisions. Power plant siting problems in this planning area would be under its jurisdiction. Details of this recommendation can be found in the *Locating Key Facilities Chapter of the Regional Report*, and in *Chapters 3 and 10 of the Regional Report*. Consistent with siting criteria suggested for other facilities of regional impact, highway planners should give special

consideration to avoiding Critical Environmental Areas (Categories A and B).

Priorities

While the Study encourages all municipalities to undertake this development strategy, the need is especially urgent in those communities with proportionately higher amounts of Critical Environmental Areas which will be under increasing development pressure. Based on the discussion in The Situation section of this chapter, these municipalities are: Easton, Raynham, Plympton, Halifax, Hanson, and Norton.

Implications

The impact of these recommendations on development patterns in the planning area, considering the amounts of area in each category and the projected population, should be significant. Application of SENE Study recommendations to the Taunton planning area towns can make an important difference in trying to ensure that the area continues to be an attractive place to live, work, and spend leisure time. It

will concurrently have the effect of preserving existing and future water supplies, improving water pollution solutions, and reducing coastal and inland flooding damages.

Although Category A and B Critical Environmental Areas comprise 146,000 acres and 41 percent of the planning area, there is adequate area left for future development at reasonable rates. In fact, most, if not all, of the growth anticipated over the next years can be accommodated on lands capable of sustaining that development with minimum environmental costs.

The approach recommended in this chapter emphasizes the importance of assessing the full range of environmental and economic costs which should be considered when making development decisions. Most importantly, this process helps to clarify how total costs borne by the public can be minimized, while degradation of the planning area's fragile natural resources can be prevented at the same time. While the SENE Study is not a comprehensive land use plan, the preceding recommendations represent key steps that land use planners can take to guide the region's future growth.

CHAPTER 4 WATER SUPPLY

The Situation

An average of 42.8 million gallons of water per day (mgd) was supplied to the Taunton planning area in 1970. Approximately 76 percent of the average or 32.7 mgd, was supplied by surface water sources. The remaining amount was supplied by ground water sources. Aquifers of the Taunton planning area yielded 3.1 billion gallons for public water supply and 1.2 billion gallons for industrial, institutional, agricultural, and private domestic supplies in 1967. Estimated safe yields in the planning area in 1970 were 64 mgd, with 70 mgd available from all sources (both within and outside the area). By 1990, the Taunton planning area's maximum day demand is expected to be about 92 mgd. Proposed additional water supplies total 28 mgd and, together with existing supplies, exceed projected demands by 6 mgd. (See Table 4.1)

The Solutions

The Fall River System

The Fall River Water Department provides supplies to: (1) the city of Fall River (11.86 mgd or 100 percent of its supply); (2) the Thomson chemical plant in Freetown (0.34 mgd); and (3) the northern part of Tiverton, Rhode Island, an out-of-basin municipality (0.27 mgd). The total amount provided by the Fall River Water Department in 1970 was 12.47 mgd.

The Fall River system obtains its water from surface supplies with a safe yield of 16.5 mgd. Fall River's original water supply, North Watuppa Pond, which has a safe yield of 7.0 mgd, is currently supplemented with water from two sources. Lake Noquochoke, an out-of-basin source located in Dartmouth (Buzzards Bay planning area), has an available safe yield of 3.0 mgd which can be pumped directly to North Watuppa Pond. However, this source is only used in emergencies, due to problems with its quality. Another surface source, the Copicut Reservoir, is located in Fall River and has a safe yield of 6.5 mgd. Supplies are pumped to North Watuppa Pond for treatment before distribution. Fall River also has rights to 11.5 mgd from Long Pond in the Lakeville Pond complex (through the Tri-City Agreement, State Chapter 400, Acts of 1924). Fall River has not exercised this right, and it has been proposed that Taunton and New Bedford, the other two parties in the agreement, acquire those rights. Further discussion of this recommendation may be found in a following section on the Taunton System, and in the Buzzards Bay Planning Area Report. Fall River's currently developed supplies, not including the

Lakeville Ponds source, are expected to be adequate through 1990. Also, Fall River has an additional capability from sources other than the Lakeville Ponds by: (1) its expansion of the Copicut Reservoir; (2) further development and treatment of water from Noquochoke Lake; and (3) the exercise of its unused stream rights of up to 6 mgd. In view of the above:

- 1. Maintain Fall River's existing surface supplies.** Fall River should maintain its existing surface water supplies, which will be adequate through 1990.

This was the only alternative considered under the various assumptions since the existing safe yield of 16.5 mgd was deemed adequate to meet population growth projections up to 1990. Proposals for a Taunton River diversion for Fall River and/or a dam were rejected because of the river's low water quality, high development and diversion costs, and significant adverse environmental impacts. The alternative of desalination is not considered economically feasible until after 1990.

The recommendation will provide a safe yield of 16.5 mgd to the Fall River system by 1990. This will allow service of 12.40 mgd (average demand) to the city of Fall River, 0.34 mgd to the chemical plant in Freetown, and 0.27 mgd to northern Tiverton.

The Somerset System

The Somerset Water Department supplies 100 percent of that municipality's water demand, which in 1970 amounted to under 2.0 mgd. The system obtains its water supply from a reservoir built recently on the Segregansett River in Dighton and a gravel-packed well in Somerset. The reservoir has a safe yield of 5.0 mgd, while the well has a capacity of 0.27 mgd, giving the system a total existing yield of 5.27 mgd. These supplies appear to be adequate to meet future increases in water demand through 1990.

- 2. Maintain Somerset's existing supplies.** Somerset should maintain its existing water supplies through 1990.

This alternative was recommended over proposals for a Taunton River diversion and/or dam, and over desalination for the reasons explained above for Fall River. The recommendation will permit service totalling 4.16 mgd (Somerset's average demand) by 1990, assuming a one percent increase in per capita demand each year according to the 1990 OBERS Series E population assumption (*Chapter 2, Regional Report*).

TABLE 4.1 SUMMARY OF 1990 WATER SUPPLY PROPOSAL: TAUNTON PLANNING AREA

| Municipality | Existing System (1970) | | 1990 Average Demand (mgd) | 1990 Design Demand (mgd) ^{b/} | Proposed Additional Sources of Supply |
|-------------------|--|--------------------------------|---------------------------|--|--|
| | Source | Safe Yield (mgd) ^{a/} | | | |
| Abington-Rockland | Great Sandy Bottom Pond and nearby wells | 2.10 | 6.00 | Same | Ground Water and Rockland Reservoir. |
| | Wells | <u>1.30</u> | | | |
| | | 3.40 | | | |
| Avon | Wells | 0.60 | 1.07 | 2.30 | Ground Water and Brockton Water Commission |
| Berkley | Private Supplies | --- | --- | --- | Private Wells |
| Bridgewater | Wells | 2.53 | 1.80 | 3.67 | Ground Water |
| Brockton | Silver Lake | 4.50 | 15.75 | Same | Ground Water and Diversions to Silver Lake |
| | Monponsett Pond | 5.40 | | | |
| | Diversion | 2.00 | | | |
| | Furnace Pond Diversion | <u>1.50</u> | | | |
| | Avon Reservoir | 13.40 | | | |
| Dighton | Well | .43 | .93 | Same | Ground Water and Taunton Regional System |
| | Taunton Water Dept. | <u>.23</u> | | | |
| | | .66 | | | |
| East Bridgewater | Well | .90 | 1.79 | 3.65 | Ground Water |
| Easton | Wells | 2.30 | 1.91 | 3.88 | Ground Water |
| Fall River | North Wattupa Pond | 7.00 | 12.40 | Same | None |
| | Noquochoke Lake | 3.00 | | | |
| | Copicut Reservoir | <u>6.50</u> | | | |
| | | 16.50 | | | |
| Foxborough | Wells | 4.65 | 3.34 | 6.35 | Ground water and Taunton Regional System |
| Freetown | Wells | - | .14 | .36 | Ground water and New Bedford Water Dept. |
| | New Bedford Water Dept. | .03 | | | |
| Halifax | Well | 0.86 | .76 | 1.69 | Ground water |
| Hanson | Brockton Water Commission | .50 | 1.32 | Same | Ground water and Brockton Water Commission |
| Lakeville | Well | - | .29 | .70 | Ground water |
| Mansfield | Wells | 3.18 | 3.08 | 5.91 | Ground water and Taunton Regional System |
| Middleborough | Wells | 1.80 | 3.02 | 5.81 | Ground water and Taunton Regional System |
| Norton | Wells | 2.00 | 1.36 | 2.86 | Ground water and Taunton Regional System |
| Plympton | Private Supplies | --- | --- | --- | Private Wells |
| Raynham | Wells | 1.09 | 2.30 | 4.58 | Ground water and Taunton Regional System |
| Somerset | Reservoir | 5.00 | 4.16 | Same | None |
| | Well | <u>0.27</u> | | | |
| | | 5.27 | | | |
| Taunton | Assawompset, Pocksha and Long Ponds | 8.00 | 6.96 | Same | Diversion and Additional Rights to Lakeville Ponds |
| | Taunton River | <u>(1.50)</u> | | | |
| | | 9.50 | | | |
| West Bridgewater | Wells | 1.90 | .70 | 1.57 | Ground water |
| Whitman | Brockton Water Commission | .74 | 1.12 | Same | Ground water and Brockton Water Commission |
| | | <u>2.64</u> | | | |

^{a/} Ground water yield reported as pumping capacity of system. Standby supplies in parentheses.^{b/} Systems relying on ground water sources must supply maximum day needs.

The Taunton System and Related Towns

Ninety-eight percent (98%) of the city of Taunton's population receives its water from the city's water department. The remaining two percent still use individual private wells. In 1970, the demand on the Taunton Water Department amounted to 5.77 mgd. An additional 0.23 mgd was supplied to the town of Dighton by the Taunton system.

The Taunton system uses surface water taken from Assawompset, Pocksha, and Long Ponds of the Lakeville Ponds complex for its source of supply. Under the terms of the 1924 Tri-City Agreement (with Fall River and New Bedford), Taunton's share of the Lakeville Ponds complex is an average of 8.0 mgd (depending on the water level). An additional 1.5 mgd can be taken as an emergency supply from the Taunton River, raising the safe yield of the system to 9.5 mgd. The existing supply of the Taunton system should be able to meet expected demand of the present service area through 1990.

Freetown. The Lakeville Ponds also provide a source of municipal supply to Freetown through the New Bedford Water Department. Some 0.03 mgd are supplied to a small service area of 150 people, about one-third of the 10 percent of Freetown's population supplied by a municipal system. The other two-thirds are served by a local ground water system, while the remaining 90 percent of the residents are served by individual private wells. The SENE Study makes the following recommendation:

3. Develop local ground water in Freetown.

Freetown should develop local ground water supplies to yield an additional 0.35 mgd.

Dighton. Ninety-eight percent of the town of Dighton's population gets its water from either the Dighton Water District or the North Dighton Fire District. The remaining two percent own individual private wells. The Dighton Water District supplied 0.36 mgd of Dighton's 0.56 mgd demand, while the North Dighton Fire District supplied the remaining 0.19 mgd in 1970.

The Dighton Water District uses two wells which have a combined pumping capacity of 0.43 mgd. A supplement of one million gallons per month is purchased from the Taunton Water Department. The North Dighton Fire District purchases its entire 0.19 mgd supply from the Taunton Water Department. Dighton's 1990 demand is projected to be 0.93 mgd. The town will need additional supplies to meet this need and this is discussed below.

Raynham. The Raynham Center Water District and the North Raynham Water District served 76 percent of Raynham's population at an average rate of 1.0 mgd from ground water sources in 1970. The remaining 24 percent use individual private wells for their supplies. The existing supplies of both water districts are expected

to be inadequate to meet the town's 1990 projected average day demands of 2.3 mgd. North Raynham has held meetings with the water systems serving Bridgewater and West Bridgewater to discuss opportunities for regional water supply management.

It is recommended that the above municipalities:

4. Develop local ground water in Dighton and Raynham. Dighton and Raynham should develop remaining local ground water resources and utilize existing interconnections with Taunton to supplement their needs.

Foxborough. This town faces the problem of low yield aquifers. Large increases in demand may result in inadequate supplies for the town's future demands. Presently, 100 percent of Foxborough's water need is met by the Foxborough Water Department. In 1970, this amount averaged 1.59 mgd. The system furnishes an additional .006 mgd to Sharon, an out-of-basin town (Boston Metropolitan planning area). For its source of supply, the Foxborough Water Department uses ten gravel-packed wells with a pumping capacity of 4.65 mgd. As the projection for Foxborough's 1990 maximum day demand is 6.35 mgd, the town will have to develop additional ground water sources, and should seek interconnections with a surface supply to assure that its peak needs are met.

Mansfield. The total population of Mansfield was served through the town water department at an average rate of 1.85 mgd in 1970. Existing pumping capacity from its municipal ground water sources is 2.6 mgd plus a reserve supply with a yield of .58 mgd. The town is planning to purchase land for additional ground water supplies. However, Mansfield will have to look outside its borders to supply its peak needs as its local ground water supplies will be insufficient to meet the projected 1990 demand of 3.08 mgd.

Middleborough. The Middleborough Water and Sewer Department served 100 percent of the town at an average rate of 1.30 mgd in 1970. The system's 1.8 mgd capacity from ground water sources is considered insufficient to meet expected future average demands of 3.02 mgd.

Norton. The town water supply system served all of Norton's water supply at an average rate of .79 mgd in 1970. The system has a 2.0 mgd pumping capacity from its ground water sources; some of the water must be treated for manganese. Steps should be taken to protect these sources from highway construction and deicing salt contamination, if or when an extension of Route 1-495 is constructed in the area. Additional supplies will be necessary, following renovation of the town's distribution system, to meet Norton's 1990 need of 1.36 mgd.

It is recommended that the above municipalities:

5. **Develop local ground water in Foxborough, Mansfield, Norton, and Middleborough.** Foxborough, Mansfield, Norton, and Middleborough should develop remaining local underground resources and construct interconnections with Taunton to supply peak needs before 1990. Care should be taken by Mansfield and Foxborough not to overdevelop ground waters in the Greenwood (Bungay) Lake drainage basin. Additional withdrawals from this basin will result in lower lake levels.

System Interconnections. It is proposed that, by 1990, Taunton provide supplemental supplies through existing and proposed interconnections to Raynham, Foxborough, Mansfield, Norton, Middleborough, and North Attleborough (in the Ten Mile basin). The Taunton system is also expected to continue supplying at least its present 0.23 mgd to Dighton. Attleboro (in the Ten Mile basin) may negotiate an agreement to purchase an average 1.5 mgd supplement from the Taunton system to supply its projected municipal demand of 11.29 mgd by 1990.

The complexity of this service system, and the amount of intertown cooperation which it implies, provide the basis for a recommendation that the city of Taunton and the towns of Dighton, Raynham, Foxborough, Mansfield, Norton, Middleborough, Attleboro, and North Attleboro form a regional water system with authority to develop and plan both water supply and water quality functions. This organization would be responsible for developing and implementing both short- and long-range proposals to supply additional water to its member towns.

The Lakeville Ponds complex has been developed to yield an estimated 31 mgd. However, the three cities which share the supply hold rights which exceed the safe yield. Fall River holds rights to 11.5 mgd; Taunton to 8.0 mgd; and New Bedford to 20.0 mgd. Because Fall River has a total available safe yield of 16.5 mgd from sources other than the Lakeville Ponds, it has been proposed that the city's rights to Long Pond under the Tri-City Agreement, be acquired by the other two parties. An estimated yield of 22.3 mgd from Assawompsett, Long, and Pocksha Ponds could then be distributed between Taunton and New Bedford, making roughly 1.4 mgd in additional safe yield available to each system.

To assure the availability of adequate supplies to meet member towns' mid-term water needs, the proposed regional water system should undertake diversion of waters from Fall Brook in Lakeville into nearby Assawompsett Pond.* Construction of a dam on the Nemasket River above Bridge Street would impound Fall Brook and the upper portions of the river. Allowing for releases into the river during dry periods to maintain minimum flows, it is reasonable to assume that up to 2.8 mgd could be added to the safe yield of Assawompsett Pond by this

project. This amount, together with Taunton's expanded share of the Lakeville Ponds complex (9.4 mgd) would provide approximately 12.2 mgd for distribution by the regional water system, an amount sufficient to supply the projected demands of member towns through 1990.

Table 4.2 is a summary of present and proposed water supply developments for the Taunton Regional System. As discussed above, resources of the existing Taunton system can be augmented to assist several neighboring towns in meeting their 1990 water needs. This includes continued sale of water to Dighton, establishment of full supply connections to Attleboro and Raynham, and supplementary hookups to five other towns which are not currently connected to the system. Approval of the Massachusetts legislature will be required before water from Taunton's Lakeville Ponds source may be shared by those towns named which do not share a common boundary with Taunton.

As water demands increase beyond 1990, the existing and proposed water supply sources discussed above will become inadequate. Because ground water resources in most basin towns will be fully developed before 2020, demands on regional surface sources such as the Lakeville Ponds and the Taunton River can be expected to increase substantially by that date. The eight towns proposed to join with Taunton in 1990 are projected to have a combined average demand of 30 mgd by 2020. Alternatives to meet this demand include further expansion of the Lakeville Ponds, a dam across the Taunton River estuary, and diversions of the Taunton River. The Taunton River dam proposal was dismissed because it would destroy the estuarine ecology of the lower river. Further expansion of the Lakeville Ponds was also not recommended due largely to a limited potential for developing additional storage capacity. Construction of a 25 mgd offstream reservoir to accept treated flood-flow diversions from the Taunton River, could help satisfy this demand. Though the full 25 mgd capacity is not anticipated to be necessary until about 2020, and capital costs are likely to be relatively high, it is clear that such a storage facility will be required sometime after 1990 to supply towns in the Taunton area with water from large capacity regional surface water sources.

The SENE Study makes the following recommendation:

6. **Expand Taunton water system to serve eight additional municipalities.** Dighton, Raynham, Foxborough, Mansfield, Norton, Middleborough, and two out-of-basin towns should join immediately with Taunton in a regional surface water system from the Lakeville Ponds. Prior to 1990, this group of towns should work to acquire a share of Fall River's rights to Long Pond and undertake diversion of Fall Brook to Assawompsett Pond. They should also investigate opportunities for

* City of New Bedford: Report on Water Works Improvements and Supply & Distribution Financing; Camp, Dresser & McKee (February 1971).

**TABLE 4.2 WATER SUPPLIES AND DEMANDS OF THE TAUNTON REGIONAL
SYSTEM 1970 - 1990 - 2020**

| SOURCE | SUPPLIES | | |
|-----------------------------------|-------------------------------------|----------------------|----------------------|
| | Available Yield (mgd) | | |
| | 1970 | 1990 | 2020 |
| Lakeville Ponds | | | |
| Assawompset Pond | 8.0 | 8.0 | 12.2 |
| Long Pond | | 1.4 | |
| Pocksha Pond | | 2.8 | |
| Fall Brook Diversion | | | |
| Taunton River | | | |
| Diversion to Off-Stream Reservoir | | | 25.0 |
| Totals | 8.0 | 12.2 | 37.2 |
| | | | |
| MUNICIPALITY | DEMANDS | | |
| | Average Demands (mgd) ^{a/} | | |
| | 1970 | 1990 | 2020 |
| Taunton | 5.77 | 6.96 | 8.5 |
| Dighton | 0.23 | 0.36 | 0.6 |
| Attleboro | | 1.54 | 8.4 |
| Foxborough | | suppl. ^{b/} | 3.5 |
| Mansfield | | suppl. ^{b/} | 0.2 |
| Middleborough | | suppl. ^{b/} | 3.9 |
| North Attleborough | | suppl. ^{b/} | suppl. ^{b/} |
| Norton | | suppl. ^{b/} | suppl. ^{b/} |
| Raynham | | 1.10 | 4.2 |
| Totals | 6.00 | > 9.96 | > 29.3 |

^{a/} Represents demands of each municipality on regional water sources (i.e. average demands exceeding yield of municipal supplies).

^{b/} Municipalities which can supply projected 1990 or 2020 average day demands from safe yield capacities existing or developable within their boundaries, but which should interconnect with a regional surface source to supply peak (max. day) demands.

diversion of the Taunton River to an off-stream storage reservoir to provide water supply after 1990.

The Brockton System and Related Communities.

The Brockton Water Commission is an in-basin supplier with several out-of-basin sources. The Commission, which obtains its 13.4 mgd supply from surface sources, presently satisfies the total demand of Brockton and Whitman and 98 percent of Hanson's demand. The average demand (including emergency supplies) on the Brockton system in 1970 amounted to 12.11 mgd, of which Brockton used 10.85 mgd, Whitman 0.74 mgd, and Hanson 0.49 mgd. It also provides 0.03 mgd to Abington, Avon, and Pembroke.

Silver Lake, located in the South Shore planning area communities of Kingston, Pembroke, and Plympton, provides the source of supply for the Brockton system. Starting in 1965, diversion of spring runoff was made from the drainage areas of Monponsett and Furnace Ponds into Silver Lake. These diversions add 7.4 mgd to Silver Lake's safe yield of 4.5 mgd. Oldham Pond is also diverted into Silver Lake. The Avon Reservoir, located in southwestern Avon, was Brockton's original water supply source, but now its 1.5 mgd are reserved for emergency situations. Thus, the total safe yield of the Brockton system amounts to 13.4 mgd.

Using the OBERS Series E population projections (*Chapter 2, Regional Report*), and a projected yearly increase in water demand of one percent per capita, by 1990 the Brockton system will require about 18.16 mgd. The Brockton area should continue to develop local ground water supplies to meet this additional 4.76 mgd need, but before 1990 it will have to import still more water from outside the basin.

Avon's Water Department supplies 100 percent of the town's total demand. The system has a safe yield of 0.6 mgd, obtained from three gravel-packed wells and one dug well in Avon. Avon's projected average demand for 1990 (at a one percent increase per capita per year) is 1.07 mgd. The water department will have to turn to an additional source of supply outside the town to meet this increased need. The Study's recommendation is:

- 7. Expand Brockton water system to supply Avon's future needs:** To meet this additional demand and supply the future needs of its existing service area, Brockton should begin immediately to explore opportunities to divert flood flows from Howard and Pine Brooks and the Jones River in Kingston to augment the safe yield of its Silver Lake supply.

In planning the development of these additional sources,

great care should be taken to minimize adverse effects of the diversions on stream ecology and downstream users.

Another supplier with out-of-basin sources is the Abington-Rockland Joint Water Works. One hundred percent of Abington's demand and a part of Pembroke's need is supplied by this system which uses Great Sandy Bottom Pond in Pembroke and a nearby well to secure 2.1 mgd of its 1970 safe yield. The remaining 1.25 mgd are supplied by local wells in Abington and Rockland and a second smaller well in Pembroke.

Consumption projections utilizing a one percent increase in per capita demand per year will result in a 1990 requirement of 6.0 mgd, close to the Abington-Rockland system's present safe yield. The recent construction of a reservoir and treatment facility on Hingham Street in Rockland and proposed development of the remaining ground water sources in Abington should provide sufficient water to meet the system's needs well beyond 1990.

Several alternative water supply actions were considered by the SENE Study, but were not recommended. The transmission of Plymouth-Carver ground water to Avon and Brockton via Silver Lake was not recommended because it is not certain that enough water from the aquifer will be available for export. In addition, if it is available, water from this source may be used to supplement the needs of South Shore municipalities. The extension of MDC service to Avon and Brockton was also rejected. Insufficient sources and high initial costs were the major reasons for failing to recommend this alternative.

Participants at the Taunton Basin Advisory Committee meeting held early in the Study preferred a solution calling for creation of a regional system serving Abington, Rockland, Avon, Brockton, Whitman, and Hanson from Silver Lake and Great Sandy Bottom Pond. Support was also expressed for development of some surface and ground water resources together with limited growth in per capita consumption. However, later municipal officials in Abington and Rockland and regional planning officials objected to joining the Brockton system because the towns can meet future needs with local sources and see no advantages in a regional water system.

Communities Relying on Ground Water

Of the 23 towns and cities in the Taunton planning area, a SENE Study survey (by the USGS) has identified eight municipalities that can meet estimated 1990 water demands with ground water. These communities are Berkley, East Bridgewater, Easton, Freetown, Halifax, Lakeville, Plympton, and West Bridgewater. Freetown has already been discussed under the Taunton Water Department section, so only the remaining seven municipalities will be considered here. Bridgewater, a community which may have enough developable ground

water to meet its 1990 needs, will also be considered.

Berkley and Plympton, which use private wells, are expected to be able to continue to rely on individual sources to supply 1990 needs. Some favorable well sites have been identified in Plympton, one of which may yield 1 mgd. This would be more than adequate to meet Plympton's projected 1990 maximum day demand of 0.7 mgd.

In 1970, East Bridgewater used an average of 0.67 mgd from one gravel-packed well with a capacity of 0.9 mgd. The municipality has plans to develop an additional well with a yield of 0.5 mgd, but even this source will not be sufficient to meet a 1990 maximum day demand of 3.65 mgd, and new ground water sources must be developed.

West Bridgewater used an average of 0.49 mgd in 1970 from two gravel-packed wells and a well field with a combined yield of 1.9 mgd. As the projected maximum day demand for 1990 is expected to be 1.57 mgd, West Bridgewater may not need to develop additional sources.

The Easton Water Department supplied Easton with 100 percent of the town's 1970 average day water requirement of 1.04 mgd. This amount is less than half of the system's pumping capacity of 2.3 mgd, all of which is obtained from ground water sources (3 wells). Projections for 1990 indicate that Easton's maximum day demand will amount to about 3.88 mgd, so the town will have to find 1.5 mgd from new ground water sources.

The total population of Halifax is served by the Halifax Water Department. Its average day 1970 demand of 0.28 mgd was met adequately by the water department's well (pumping capacity of 0.86). However, by 1990 the municipality's maximum day demand is expected to reach 1.69 mgd, so an additional 0.83 mgd of ground water must be developed.

About 76 percent of Lakeville's population use individual private wells for water supply. The remaining 24 percent is served by a private supplier, Resort Supply, Inc. The maximum day demand in the 1990's is expected to be 0.7 mgd. Lakeville's ground water will continue to meet this need.

Bridgewater might be able to meet its estimated 1990 water demands with ground water, but will require low yield wells (200 gallons per minute or less) to tap thin, a really

extensive aquifers, or poorly conductive, fine-grained aquifers. Bridgewater's 1970 average day demand of 0.76 mgd was supplied by ground water from three gravel-packed wells operated by the Bridgewater Water and Sewer Department. The pumping capacity of these three wells is 2.13 mgd. Another gravel-packed well, reserved for emergencies, has a yield of 0.40 mgd for a total capacity of 2.53 mgd. Bridgewater is also the site of the Massachusetts Correctional Institution, which operates its own water system. Bridgewater plans to develop an 8-inch well with a pumping capacity of 0.45 mgd, and the Correctional Institute is also conducting a study of an additional well site. As of 1990, Bridgewater's maximum day demand should be approximately 3.67 mgd, and 1.14 mgd would have to be developed for the municipality's future needs.

In addition to the general basin-wide recommendation for encouraging water conservation, the SENE Study makes the following recommendations:

8. Maintain private wells in Berkley and Plympton. Berkley and Plympton should maintain existing private well sources through 1990.

9. Develop additional ground water resources in six planning area municipalities. Bridgewater, East Bridgewater, West Bridgewater, Easton, Halifax and Lakeville should develop additional ground water resources.

In order to maximize the potential of ground water resources, it will be necessary for municipalities to maintain ground water recharge and to prevent contamination from natural and man-made sources. Activities shown to be hazardous to ground water quality, such as maintenance of sanitary landfills, storage and use of highway deicing salts, and industrial waste disposal, to name only a few, should be restricted from recharge areas of both existing and potential municipal supply wells.

An alternative which was not recommended suggested surface water impoundments on the Hockomock, Nemasket, and/or Winnetuxet Rivers. This alternative was rejected because the water of these rivers is presently or potentially of poor quality. The high capital costs of such a project and the flooding of large areas of land were also factors in the decision not to recommend this alternative.

CHAPTER 5 WATER QUALITY

The Situation

The Taunton River and its tributaries drain nearly 530 square miles of southeastern Massachusetts. The river begins in Bridgewater at the confluence of the Town and Matfield Rivers, and flows approximately 38 miles to Mount Hope Bay, an arm of Narragansett Bay.

With the exception of a dam in Bridgewater at its very beginning, the Taunton River flows without major physical obstruction on its course toward Mount Hope Bay. The terrain is level, so the river is generally slow-moving with only a few short sections of fast water. The fresh water portion of the river maintains a fairly uniform width of about 80 feet. A small headwater stream, the Salisbury Plain River, is also of importance since it receives the effluent from the Brockton Wastewater Treatment Facility. The Taunton then flows southeasterly through Bridgewater and turns toward the southwest, forming the Bridgewater-Halifax and Bridgewater-Middleborough town boundaries. Along this section, the Taunton receives the flow of two fairly large tributaries, the Winnetuxet and Nemasket Rivers. Other major tributaries include the Mill River, the Three Mile River (formed at the confluence of the Rumford and Wading Rivers), and the Assonet River.

Results of recent water quality surveys conducted by the Massachusetts Division of Water Pollution Control indicate that violations of water quality standards occur throughout the Taunton basin. The tidal portion of the Taunton is below Class SC quality, though the goal for this portion is Class SB. Similarly, the fresh water segment from the Brockton treatment facility downstream to the tidal segment is Class D or lower, with a Class C goal. Tributaries are similarly below applicable standards. Most major mu-

nicipal and industrial wastewater discharges are presently inadequately treated and therefore are significant contributors to the violations, particularly in the three major urban centers: Brockton, Taunton, and Fall River. In addition, a number of smaller municipal and industrial sources degrade the quality of smaller streams which are tributaries to the Taunton River, and thermal discharges probably limit the potential downstream passage of shad in late summer.

Several areas which do not have sewer systems also contribute to isolated pockets of water quality degradation, in the form of high bacterial levels and nutrient concentrations. These areas include portions of Whitman, Norton, Raynham, Dighton, Lakeville, and Freetown. All are considering sewer extensions or facilities construction to alleviate the problems. The communities with some form of municipal sewage system are shown in Table 5.1.

Other problems not associated with direct municipal and industrial discharges include: urban runoff (Brockton, Taunton, Fall River), agricultural runoff from improper agricultural manure spreading practices (Halifax), combined sewers (Taunton, Fall River), salt used for highway deicing, summer low flows downstream from municipal and institutional withdrawals and sediment from sand and gravel operations (Bridgewater, Halifax).

The Solutions

Restoration

"Urban runoff" is a term generally given to stormwater which is transmitted to a watercourse directly from the paved and impervious urban lands. In fact, in the past, the engineering objective for "good" drainage was to effect this

TABLE 5.1 SEWER SERVICE: TAUNTON PLANNING AREA

| Sewer System | 1970 Population Served | Degree of Treatment | Receiving Waters |
|---------------|------------------------|---------------------|-----------------------|
| Brockton | 84,000 | Secondary | Salisbury Plain River |
| Bridgewater | 4,000 | Secondary | Town River |
| Middleborough | 5,700 | Secondary | Nemasket River |
| Foxborough | 1,000 | Primary | Robinson Brook |
| Mansfield | 4,600 | Secondary | Back Bay Brook |
| Taunton | 23,000 | Primary | Taunton River |
| North Dighton | 1,400 | None | Three Mile River |
| Somerset | 4,000 | Secondary | Taunton River |
| Fall River | 92,000 | Primary | Taunton River |

transmission as expeditiously as possible by means of paved ditches, conduits, and pipes. There was little attempt to minimize the amount of this runoff reaching the water-course, let alone improve its quality.

Major sources of urban runoff are the combined sewer systems discussed previously, since they serve the largest, most highly developed areas in the region. However, any large city will exhibit runoff problems. This was illustrated in Brockton by the Massachusetts Division of Water Pollution Control. "Wet-weather" sampling, when runoff occurs, showed in-stream violations of bacterial standards for swimmable waters. No violations existed during dry periods. Other indicators of water quality showed similar increases. Such substantive investigation has been lacking in most other areas of the region and extensive "wet-weather" stream surveys are needed throughout the region (see recommendation 12).

Many of the "treatment" techniques for combined sewers can also be applied to separate stormwater sewers as well. The key to this problem, however, is prevention. Growth limitations and guidance can reduce the threat to water quality from runoff related to urban development. This is based upon the premise that increased runoff results as more land is developed and impervious areas increase. Thus, if growth is slowed or placed in nonsensitive areas, water quality benefits will accrue. This position strongly reflects the major land use theme of the Study as outlined in *Chapter 3*.

In response to these problems, the Massachusetts Division of Water Pollution Control has developed a water quality management plan for the Taunton River Basin with treatment plant configurations, allowable loadings, and target dates. The major points of the plan to be implemented by planning area municipalities (one of which for Middleborough is already underway) include the following (target completion dates in parentheses):

1. **Expand the existing Brockton secondary facility to serve Avon and part of Abington.** The Brockton facility will be upgraded to provide advanced treatment with discharge to the Salisbury Plain River to serve Avon and a small portion of Abington. (4/77)
2. **Form the Rumford River Sewer District.** An advanced wastewater treatment facility should be constructed in Norton, discharging to the Three Mile River and serving Foxborough, Mansfield, and Norton. (2/78)
3. **Form the Old Colony Water Pollution Abatement District.** An advanced wastewater treatment facility should be constructed in Bridgewater, discharging to the Taunton River and serving Easton, Bridgewater, East Bridgewater, West Bridgewater, Whitman, and a portion of Abington. (8/78)
4. **Discharge Hanson's wastewater to an advanced treatment facility.** Hanson will eventually discharge to a regional advanced wastewater treatment facility at Bridgewater or on the North River. (no date given).
5. **Expand and upgrade Middleborough's existing secondary treatment facility.** Provide advanced treatment at Middleborough, discharging to the Nemasket River. (6/76) A portion of northern Lakeville will be served in the future.
6. **Upgrade Taunton's existing primary treatment facility.** A secondary treatment plant with ammonia reduction should be constructed in Taunton (6/76). Provision for nitrogen and phosphorus removal will also be made. Raynham and North Dighton will also be served. The plant will also treat several industries now discharging to the Taunton River. Combined sewer abatement is necessary. Studies will be instituted.
7. **Maintain the existing Somerset secondary treatment facility.** Provide service to Swansea from the present Somerset treatment plant. This recommendation is being evaluated by the Southeastern Regional Planning and Economic Development District.
8. **Expand and upgrade Fall River's existing primary facility to secondary.** Fall River's existing treatment plant should be upgraded and expanded to provide service to western Freetown and northern Tiverton, Rhode Island (3/79). Evaluation of the combined sewer problem is underway, and abatement is necessary.

Preliminary construction costs for the preceding scheme include major interceptors and treatment facility costs only: Abington — \$600,000; Brockton — \$11,000,000; Avon — \$3,300,000; Whitman — \$4,300,000; Hanson — \$3,300,000; Easton — \$3,700,000; West Bridgewater — \$2,500,000; East Bridgewater — \$4,100,000; Foxborough — \$5,600,000; Mansfield — \$6,400,000; Norton — \$4,300,000; Raynham — \$6,750,000; Taunton — \$8,000,000; Dighton — \$1,275,000 (includes advanced treatment facility in South Dighton); Middleborough — \$2,900,000; Lakeville — \$1,660,000; Freetown — \$1,950,000; Somerset — \$2,700,000; Fall River — \$7,750,000.

Septic Systems. Another threat to water quality is malfunctioning septic systems. These have resulted in the preceding proposals for sewer service and attendant treatment facilities. The principal alternative measures for minimizing septic system problems are (a) establishing and enforcing effective criteria and compliance procedures, and (b) increasing use of dry disposal systems.

Establishing and enforcing effective criteria and compliance procedures is easily the most important alternative. An in-depth look at the criteria for designing and siting individual subsurface disposal systems might disclose some aspects of existing regulations that still allow problems to develop. For example, high percolation rates coupled with the minimum allowable depth to ground water may result in bacterial contamination, nitrate build-up, or even phosphate build-up in the ground water. Also allowing systems to be constructed on fill material might invite clogging conditions at the interface between the bottom of the fill and the original ground surface.

Massachusetts contemplated reviewing and updating its regulations regarding individual disposal systems and there is strong public support that this step be taken. With proper enforcement, and by restricting the use of such systems to those lands suitable for septic tanks, individual disposal systems should continue to be useful for part of future residential development. Without such precautions, the cumulative failure of individual systems will intensify pressure for sewer extensions and new treatment works. The result will be new concentrations of effluent in high quality streams, loss of in-basin ground water resources, increased municipal service costs, and, inevitably, the increased density of development induced by sewer service.

Increasing use of dry disposal systems in individual residences may, in the future, alleviate some of the problems of septic systems. The only residue is a small quantity of compost which can be removed about once a year. Wastewater from kitchen and bathroom sinks, showers, and tubs must still be disposed of in septic tanks or sewer systems, however.

The objective of the dry disposal alternative would be to provide individual disposal systems which will not only prevent human health hazards on-site, but will also prevent water quality degradation. Benefits will also be derived by the receiving watercourse if the need for sewers and therefore effluent outfalls can be delayed or eliminated by these dry disposal systems. Based upon the foregoing discussion, the SENE Study recommends that municipalities should:

- 10. Enforce local subsurface disposal regulations.** Together with the Department of Environmental Quality Engineering, municipalities should improve enforcement of local regulations governing individual subsurface disposal systems. Municipalities

should give consideration to selectively allowing innovative dry or "composting" disposal units.

This recommendation should, after implementation, result in the need for fewer public sewer systems as well as achieving more efficient operation of subsurface systems.

Sanitary Landfills. Several landfills in the basin have been identified as having problems which have caused, or could cause, water quality degradation. Problems with surface drainage, leachate, and lowest portion of the fill in the water table are experienced by sites in: Abington, Brockton, Whitman, Bridgewater, Raynham, South Dighton, Freetown, Lakeville, and Fall River. Halifax and Plympton experience the first two problems and Pembroke the first and third. Therefore, the SENE Study makes the following recommendation:

- 11. Operate and locate landfills in accordance with sound sanitary landfill regulations.** Further field investigation by the Department of Environmental Quality Engineering, is needed to better define the water quality problems associated with existing and abandoned solid waste disposal areas located adjacent to the Taunton River and its tributaries.

Stormwater. Stormwater runoff from highly developed areas is an important source of water pollution, and steps should be taken to reduce it. Because of the urbanized nature of parts of the planning area, it is important that stormwater sampling be carried out in order to provide a rational basis for a badly needed non-point source abatement program (see Chapter 5, *Regional Report*). The SENE Study recommendation is as follows:

- 12. Begin stormwater and wet-weather stream sampling.** In the Taunton planning area, the Massachusetts Department of Environmental Quality Engineering should begin a major year-round stormwater and wet-weather stream sampling program.

In addition, to reduce the amount of stormwater runoff from new developments, the SENE Study recommends that municipalities in the Taunton planning area:

- 13. Attenuate runoff from new urban developments.** The Massachusetts Department of Environmental Quality Engineering should encourage the municipalities to adopt subdivision controls which emphasize open areas and the use of permeable drainage ditches. Municipalities should also provide attractive and safe stormwater detention ponds, thereby also augmenting ground water recharge.

CHAPTER 6 OUTDOOR RECREATION

This chapter includes a series of recommendations for managing a portion of the Taunton planning area's water and related land resources for boating, camping, picnicking, extensive outdoor recreation (e.g., hiking, nature study, etc.), hunting, and fishing. The largest recreational deficiency is swimming. The planning area's four beaches are adequate to meet less than a quarter of the 1990 needs, and there is no room for expansion. Therefore, in the future, bathers will have to turn to beaches in the Narragansett Bay, Cape Cod, and Buzzards Bay planning areas even more than before.

Chapter 6 of the Regional Report explains much of the thinking behind the recommendations which follow, specifically with regard to the determination of needs, the options considered, but not recommended, and the full economic, social and environmental implications.

RECREATIONAL BOATING

The Situation

The Taunton River is tidal and generally navigable from Mount Hope Bay to the Weir Village bridge at Taunton,

TABLE 6.1 EXISTING RECREATIONAL BOATING FLEET: TAUNTON PLANNING AREA

| Municipality | Slips | Moorings | Total |
|--------------|-------|----------|-------|
| Taunton | 20 | 5 | 25 |
| Berkley | 10 | 20 | 30 |
| Freetown | -- | -- | -- |
| Dighton | 10 | 45 | 55 |
| Somerset | 95 | 75 | 170 |
| Fall River | 95 | 45 | 140 |
| Totals | 230 | 190 | 420 |

a total distance of about 12.5 miles. Since the main deepwater commercial channel lies mostly within Mount Hope Bay, a part of Narragansett Bay, the commercial needs for deepening the channel to 40 feet inland to the Montaup turning basin at Somerset are discussed in the Narragansett Bay navigation section. Above that point, the controlling depth in the channel is 10 feet, up to Peters Point in Berkley, and then four feet to the Taunton municipal wharf. The mean range of tide is 4.4 feet at Fall River and 2.8 feet at Taunton.

Table 6.1 presents an inventory made by aerial survey in 1972 by the Corps of Engineers to determine the Taunton estuary's recreational boating fleet by town.

While it is expected that by 1990 the demand for 900 additional boat spaces could develop within the planning area, the potential number which would be served is far greater, with possible expansion capable of accommodating about 2,000 additional boats. As estimated by the Corps of Engineers, the town-by-town potential is presented in Table 6.2.

The potential in the Taunton planning area for recreational boating developments on a regional scale is nearly unmatched in SENE. The following recommendations amplify how such facilities might be developed without severe environmental disruption.

The Solutions

Recreational boating is the fastest growing leisure time sport, but throughout the SENE region, pleasure boaters are getting squeezed out of existing harbors, many of which are nearly at capacity. The lower Taunton-Mount Hope Bay portion of SENE represents an attractive location for regional harbor development because it is relatively protected, convenient to other harbors in Narragansett Bay, Buzzards Bay, and Cape Cod, and most of the estuary is undeveloped.

TABLE 6.2 RECONNAISSANCE OF POTENTIAL FOR ADDITIONAL BOATING FACILITIES*

| Municipality | Potential Additional Slips | Potential Additional Anchorage | Potential Additional Moorings | Potential Additional Spaces (Tot.) |
|--------------|----------------------------------|--------------------------------------|-------------------------------------|--|
| Fall River | 215 | 3 | 110 | 325 |
| Somerset | 640 | 4 | 280 | 920 |
| Dighton | 80 | 2 | 80 | 160 |
| Freetown | 320 | - | - | 320 |
| Berkley | 340 | - | - | 340 |
| Totals | 1,595 | 9 | 470 | 2,065 |

*These are preliminary estimates and **should not** be construed as justification for marina development or expansion. Further study – either by towns or by the proposed statewide boating advisory committee (see recommendation 5 in *Chapter 6 of the Regional Report*) – is needed to determine capacities for new facilities.

On the one hand, intensive recreational development can stimulate the growth of ancillary services, thereby creating a few new jobs. On the other hand, the inflow of more people in seasonal fluctuations can strain municipal services, and the development can lower local environmental quality. These widely known implications can create a considerable amount of local resistance. From the viewpoint of a prospective marina developer, there are problems related to finances, taxes which seasonal business cannot support, and the need for strong business management skills.

The SENE Study has proposed the formation of a statewide recreational advisory committee composed of the Departments of Fisheries, Wildlife, and Recreational Vehicles and Environmental Management, municipal authorities, and representative recreational interests (*see Chapter 6, Regional Report*). The committee could develop guidelines for planning suitable locations for recreational development, guarantee loans for recreational entrepreneurs, and develop training programs. A statewide boating advisory committee could guide marina development. To promote a coordinated effort between recreational entrepreneurs and municipalities, the SENE Study recommends:

1. **Form a state boating advisory committee to guide new marina development.** A state boating advisory committee composed of the Department of Fisheries, Wildlife, and Recreational Vehicles, the Department of Environmental Management, and primarily boating, conservation, and municipal interests should encourage orderly marina development, harmonious with local interests, in the Taunton planning area. The Corps of Engineers has estimated there is the potential for about 1500 slips, and potential for 9 anchorages which could provide 470 moorings.
2. **Supervise new boating expansion.** The municipalities should consider hiring harbor masters to supervise the expansion of boating facilities, if they have not already done so, in Berkley, Freetown, Somerset, Dighton, and Fall River. Protection of Critical Environmental Areas, particularly shallow aquatic habitats, should be of utmost concern.

In order to accommodate recreational boating traffic, the SENE Study recommends:

3. **Consider dredging a 6-foot deep Taunton River channel.** The Massachusetts Department of Public Works and the Corps of Engineers should consider the dredging of a 6-foot deep recreational channel in the lower Taunton River from Dighton to Berkley.

Dredging has a short-term effect on the amount of dissolved oxygen in water, but destroys shallow, aquatic vegetation. This action should be carried out during an appropriate season and in a manner which has minimal impact on fisheries production, specifically for the anadromous species referenced in *Chapter 7 of this report*.

Day boaters and deep sea fishermen need boat ramps for access to the sea. To meet this need, the SENE Study recommends:

4. **Develop new boat ramps.** The Public Access Board and Department of Public Works, in conjunction with the communities, should develop additional public boat ramps and parking facilities wherever feasible.

Implications

By taking these actions, a significant regional boating center could be developed on the lower Taunton River. An important opportunity exists to develop a major recreational boating facility with access to Narragansett Bay by capitalizing on the untapped potential of the Taunton estuary. The lower reaches of the river could satisfy boating opportunities for adjacent watershed areas where demands exceed supplies. For example, in the Buzzards Bay area, the demand (as much as 1,800 boats) will begin to exceed the developable supply (about 1,030 boat slips) by about 1990. At that time, the Taunton River area will be in a position to accept out-of-basin demands, as well as those from inland communities, who will also look toward the river to meet their boating needs.

An environmental impact statement for the dredging project mentioned in recommendation 3 is required by law. The statement should assess the suitability of channel alignment and dredge materials disposal sites. Shellfish grounds, eelgrass beds, beds of other productive aquatic vegetation, and other shallow water and wetland areas of value to fish and wildlife resources and uses should be avoided.

GENERAL

OUTDOOR RECREATION

The Situation

People who live in the Taunton planning area gain great satisfaction that over 80 percent of the planning area is richly endowed with a variety of natural resources — forest, wetlands, fields, open water. They use them for extensive outdoor recreation (hiking, nature study, etc.). Visitors who may need campgrounds and picnic facilities also appreciate the apparent wealth of open spaces.

About four percent of the total Taunton planning area has been formally designated as conservation and recreation lands. The state owns 8,040 acres of forest areas in Freetown, Fall River, Foxborough, and Massasoit. Municipal conservation lands and parks comprise about 5,600 acres, and private interests own about 3,380 acres of open space. Over 81 percent of the planning area is forest, field, wetland, or open water.

There are suggestions that more water and related land resources should be acquired and developed to meet future recreational demands. The Bureau of Outdoor Recreation estimates that existing picnic facilities in the planning area would meet less than a fifth of the 1990 demands. There are now enough campsites to support about a sixth of the 1990 demands. The publicly accessible acreage for possible outdoor recreation meets over half the 1990 demands.

The Solutions

Many water supply reservoirs in the Taunton planning area are quasi-wilderness resources. They have persisted as such because water authorities, legally bound to protect the quality of drinking water supplies, prohibit trespassing for any purpose. Extensive outdoor recreation is not necessarily a threat to public health, particularly on storage reservoirs, nor is it illegal. However, such limited forms of recreation are rarely permitted, primarily because of the management problems they pose to water authorities. Finances large enough to acquire natural areas of equal quality and size are difficult to pull together, and social pressures for recreational use will mount. To satisfy low-intensity outdoor recreational needs, the Study recommends the following action:

- 5. Develop guidelines for planning low-intensity recreation on secondary reservoir lands.** The Departments of Environmental Management and Environmental Quality Engineering should prepare guidelines and regulations for low-intensity recreation on storage reservoirs (*Chapter 6 of the SENE Regional Report*). Local water authorities should assess on a case by case basis the suitability of storage reservoirs for low-intensity recreation, especially Assawompset Pond, Great and Little Quittacas Ponds, Pocksha Pond, Long Pond, and Watuppa Reservation. A combination of user fees and DEM support could support maintenance and policing.

There are roughly 10,000 acres of reservoir lands in the Taunton planning area which could satisfy about a third of the 1990 needs for extensive outdoor recreation. Another

relatively inexpensive means of making up the remaining unsatisfied needs is through legislative channels, such as wetlands protection, which is discussed further in this chapter and in *Chapter 8*. Also, the Massachusetts Scenic River Legislation enables the Commissioner of DEM to designate 100 yards on either side of portions of scenic rivers as components of a scenic rivers system. The SENE Study recommends the following action:

- 6. Designate the Taunton as a scenic river.** The Massachusetts Department of Environmental Management should implement the existing scenic rivers legislation and include stretches of the Taunton River, from Paper Mill Village in Bridgewater to the Route 44 bridge in Raynham as a component. A report prepared by the Bureau of Outdoor Recreation for the SENE Study suggests several access points for acquisition and for development of picnic areas and campsites. Planned improvement in water quality is important in realizing the river's full recreational potential.

To completely satisfy extensive outdoor recreation demands and to maintain the planning area's outstanding environmental quality, the SENE Study recommends the acquisition and protection of nearly 7,000 acres of valuable resources:

- 7. Acquire four new state natural areas.** The Massachusetts Department of Environmental Management should acquire additional portions of the Hockomock Swamp, shoreline along Norton Reservoir, and islands on Lake Nippenicket and Norton Reservoir.

DEM is already using a \$5 million bond to acquire portions of the Hockomock Swamp, and Land and Water Conservation Funds could contribute to financing the other acquisitions. Consistent with Study policy, several thousand acres of land could be protected through this recommendation.

Tourist needs for camping and picnicking facilities can be partially met through new private developments. Again, private recreational entrepreneurs are beset with problems of finances, resistance from municipal officials, and failures related to seasonal fluctuations in tourism. These intensively used facilities are reputed to contaminate water quality and snarl traffic. For private recreational development to successfully do more than just "make up a gap", entrepreneurs need support and municipalities must specify building and sanitation standards and must identify locations where the facilities might most appropriately be located. The Study's proposed recreational advisory committee, described in the

recreational boating section, could provide the guidance which both interests need.

As a more immediate solution to the anticipated deficiencies in camping and picnicking facilities, the SENE Study recommends the expansion and development of state owned property:

8. **Expand and develop camping and picnicking in state forests.** The Massachusetts Department of Environmental Management should expand and develop camping and picnicking facilities in Freetown, Fall River, and Foxborough.

This action would satisfy approximately 10 percent of the anticipated 1990 needs for campsites. Plate 2 shows the location of Critical Environmental Areas, which, as *Chapter 3* explains, have important roles in natural processes such as riverine and coastal flooding and erosion protection, water supply, and wildlife protection. These areas require protection, but could also be used for low-intensity recreation. Since protection and development of such resources is best coordinated at the local level, the SENE Study makes the following recommendation:

9. **Use SENE Development Capabilities Map in planning open space.** Municipalities should plan Critical Environmental Areas (identified on SENE Development Capabilities Map (Plate 2) for open space protection and greenbelt programs. *Methods for protecting such resources without outright acquisition are described in Chapter 8 of the SENE Regional Report.*

Implications

If these actions are implemented, they would successfully satisfy most of the Taunton planning area's 1990 needs for extensive outdoor recreation, about 85 percent of the needs for camping facilities, and at least 20 percent of the needs for picnic facilities. Picnicking facilities were considered to be less important than the other needs because the activity can take place on an informal basis without the necessity for facility construction.

Of all the recommendations in this chapter, highest priority is placed on those which are relatively the least costly. For example, implementing scenic rivers legislation is an inexpensive means of protecting Critical Environmental Areas. High priority is given to providing access to water supply lands, for non water-contact sports rather than acquiring equal acreages of, or public rights-of-way to, privately owned lands. This latter alternative was rejected because it appears less expen-

sive to develop facilities at resources which are already publicly owned.

For the same reason, further research into using public water supply reservoirs for water-contact sports is recommended in lieu of acquiring additional beaches such as Long Pond in Lakeville, or the west side of Stafford Pond.

Private recreation development, somewhat more difficult to predict, will play an important role in satisfying unmet needs, particularly for camping. Small scale acquisition for conservation and recreation purposes will also play a vital role in satisfying extensive recreation needs.

WILDLIFE AND FRESH WATER FISHERIES

The Situation

Most of the Taunton area is relatively undeveloped — over 81 percent of the area is either forest land, agricultural land, wetlands, or open water. Over 63 percent of the planning area's wildlife habitat is open to hunting and wildlife enjoyment, but only 50 percent of the forest land is rated fair wildlife habitat. Nine thousand three hundred (9,300) acres are publicly owned and open to hunting; another 160,000 are privately owned and open to hunting and wildlife enjoyment. This total, if it remains open and unchanged, would meet about 19 percent of the total 1990 in-basin demands for hunting. The Commonwealth is presently taking positive steps toward protecting the largest fresh water wetland in the planning area. The Division of Fisheries and Wildlife is using a \$5 million bond to acquire portions of the Hockomock Swamp.

Of the 130 (16,070 acres) fresh water ponds 10 acres and larger in the basin only 19 (5,300 acres) have guaranteed state-wide public access. Of the 175 miles of stream the amount in public ownership and open to public fishing is negligible. If all of these waters had adequate public access and were under fisheries management, they could support an estimated 730,000 man days of fishing per year, approximately 80 percent of the planning area's 1990 demand.

The Taunton's fish and wildlife resources are utilized by sportsmen from the Boston metropolitan area. Certainly, fishermen, frustrated by poor quality fishing experiences within the metropolitan area, will probably travel to the Taunton.

Another fishery resource with great potential is the propagation of anadromous species. Unlike most major rivers in New England, the main stem of the Taunton River is not blocked by dams and thus has excellent anadromous fish potential. Unfortunately, pollution has decimated the

shad and alewives that once populated the river. Alewives are still present, but the pollution and dams on the tributaries have held their population well below the potential of this river system. Shad are almost non-existent.

Industrial and municipal discharges from the city of Taunton have lowered the dissolved oxygen content in reaches below the city to levels which are lethal to fish. Most spawning fish must pass through this area, and juvenile fish kills have been recorded. The effect on adult alewives is unknown.

The Massachusetts Water Resources Commission has said that water quality must be improved to a point where dissolved oxygen is not less than 5 parts per million. When this goal is accomplished, this portion of the river will no longer be a hazard to anadromous fish migrations.

The Solutions

Chapter 6 of the SENE Regional Report describes four options for satisfying the planning area's future demands for wildlife, two options for future fishing demands, and the implications of all six options. Based on an evaluation of those options, the following recommendations would satisfy significant portions of the planning area's needs for fisheries and wildlife.

Due to the multiple benefits of wetlands for flood damage reduction and wildlife production, the Study has recommended their protection to the maximum extent possible. This can be done without harming the region's economic growth (see *Chapter 3 of the Regional Report*). The Massachusetts Wetlands Protection Act authorizes municipalities and the state to grant permits for proposed alteration of wetlands, but often their efforts are frustrated by insufficient knowledge of expertise. Recently the Soil Conservation Service has developed a program whereby communities can get technical information about wetlands (and other natural resources) through Conservation District Offices. Because municipalities can protect significant amounts of wetlands through legislative channels, the Study encourages them to enforce the legislation with this recommendation:

- 10. Enforce wetlands legislation. Conservation commissions should develop technical information needed to enforce wetlands legislation and to protect other natural resources, using the Natural Resources Planning Program administered by the Conservation District Offices.**

Outright acquisition is the safest assurance that wildlife habitats will be protected, and the state's responsibilities should be to purchase those areas of regional significance

including portions of the Hockomock Swamp in Bridgewater. *Chapter 6, SENE Regional Report*). However, smaller wetlands and adjacent, or separate, uplands are often the most productive habitats, and frequently municipalities prefer to control them. Hence, the SENE Study makes the following recommendation:

- 11. Acquire important wetland wildlife habitats. Communities and/or private interests should acquire wetlands most important for wildlife production (identified in *SENE Study single-purpose inventory available in the NERBC files*) throughout the planning area.**

Edges between forest, field, and wetland are often highly productive wildlife habitats. Some of the Study's major policies involve the protection of prime agricultural soils, wetlands, and unique natural areas (components of Category A and B resources). Actions to protect these resources — described in *Chapter 3 of the SENE Regional Report* — have secondary benefits for the wildlife enthusiast or hunter because of their implications for wildlife productivity.

Recommendations to facilitate anadromous fish restoration are:

- 12. Construct fishways on eleven rivers. The Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles should construct fishways on the Three Mile River, Mill River, Matfield River, and Beaver Brook.**
- 13. Maintain fishways on the Nemasket River. The Massachusetts Department of Environmental Management should maintain fish ladders on the Nemasket River. Low flow regulation using releases from the Assawompset Pond should be continued.**

Recommendations for managing Critical Environmental Areas would greatly improve the quality and productivity of important wildlife habitats and could support 94 percent of the 1990 demands. Information was not available to ascertain the effectiveness of options such as arranging state management of privately owned wildlife lands in exchange for public access or the possibility of enlarging the boundaries of state hunting areas. Private organizations also will play increasingly important roles in protecting valuable wildlife habitat to meet needs for nature study and open space. Past experience indicates that most wildlife enjoyment occurs on privately or quasi-privately owned lands. The option of arranging public access to privately owned wildlife habitat was not recommended; first, because of the expense involved; second, because hunting is

prohibited in several communities; and, third, because preferences expressed at the public workshop did not support the idea of public access to privately-owned land for hunting.

Creating new wetlands was not recommended because the high costs involved in initial outlay would be better spent in acquiring wetlands which already exist and are known to be highly productive.

Productive fresh water fisheries persist in the planning area's ponds, lakes, and streams. The Massachusetts Division of Fisheries and Wildlife has an active program of stream-bank acquisition and the Public Access Board is legally charged to acquire public access to "great ponds", (natural ponds 20 acres and larger) for fishing, and natural ponds 10 acres and larger for other recreational purposes. To ensure the availability of fresh water fisheries for future generations the Study recommends that the Massachusetts legislature:

- 14. Designate ponds ten acres and larger as Great Ponds. The Massachusetts legislature should change the existing Great Ponds Act to designate ponds 10 acres and larger "great ponds" for fishing.**

- 15. Acquire access to ponds for fishing.**

The Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles should evaluate ponds for potential fish production and acquire public access to those with the most favorable recreational fishing conditions. There are at least 28 ponds of good or best fishing potential. *This lengthy list can be obtained from SENE Study single-purpose inventory available in the NERBC files.*

The quality of the fishing experience must be assured on the most valuable fishing streams by means of protective buffer strips and, especially in the case of the Segregansett River, low flow augmentation. In the case of the Jones River, minimum low flows must be maintained from Silver Lake.

In addition, *in Chapter 6 of the Regional Report*, the acquisition of streambank access to the Winnetuxet River, believed by state and federal authorities to have regional significance for fresh water fishing has been recommended.

The combined recommendations for fresh water fishing would substantially increase the amount of publicly accessible resources. The alternative of creating impoundments was not considered because of the high costs and low return on satisfying total 1990 demands.

CHAPTER 7 MARINE MANAGEMENT

Since the few major marine-related issues in the Taunton area relate exclusively to Narragansett Bay, most have been grouped for ease of reference together in the Narragansett Bay Planning Area Report. Although discussion in this Planning Area Report will deal directly only with urban waterfronts, additional information from a wider perspective can be found in the *Regional Report chapter on Marine Management (Chapter 7)*. That chapter covers offshore fisheries, shellfish and aquaculture, port development, dredged materials disposal, offshore sand and gravel, as well as urban waterfronts.

Additional marine-related topics, such as recreational boating, beach swimming, coastal access can be found in *Chapter 6 of this report or the Regional Report*. Similarly, discussions on power plant siting, including coastal sites, and regional petroleum needs, including coastal implications for tank farms, can be found in *Chapter 9, Locating Key Facilities of this report and the Regional Report*. The Taunton River estuary has valuable shellfish flats. Efforts to improve water quality mentioned in *Chapter 5* and to improve the flats by means of oxygenating will increase the availability of these areas for public use.

URBAN WATERFRONTS

The Situation

New England's port cities were largely responsible for the area's rapid economic growth and development in the eighteenth and nineteenth centuries. As noted in New York's "Waterfront Workshop" conducted by the City's Planning Commission in 1974:

"Time and technology have left stranded many once-busy segments of the waterfront. Brick-yards, stoneyards, lumberyards, and coal terminals have either gone out of business or moved elsewhere. Containerization has shifted the volume of shipping business, and airlines and cruises have transformed passenger ship piers.

"These changes have opened up the waterfront's potential, although in a double-edged fashion: because one type of development usually precludes all other alternatives, proposals may generate counter-proposals. A housing plan is met with the suggestion that a park would be preferable, a plan to site industry may arouse environmentalists, a plan to turn over an idle pier for recreation may be attacked as a blow to shipping. Almost

everyone agrees that the shoreline is too valuable to be allowed to lie fallow, but agreement on a specific plan may be difficult to obtain. This is one of many contradictions enshrouding the waterfront."

In order to recapture the vitality which lies just beneath the surface of decay and neglect, a few institutional and administrative changes are needed, backed by public awareness. Several cities and towns have initiated or carried out sound programs for waterfront development or renewal, although their success has occurred in spite of, rather than because of, current institutional and public policy.

At present, few industries in Fall River depend to any great degree on water transportation except for transportation of fuels. The declining importance of water transportation relative to other modes in recent years, with the exception of pleasure craft, is the major factor behind the lack of port use in Fall River. However, the majority of land uses along the Fall River waterfront are industrial. A rail line along the waterfront utilizes a major portion of the frontage and precludes development at a number of places, leaving large portions of the shoreline undeveloped. The Western Expressway, now under construction, similarly uses waterfront land along part of its course and creates a narrow, undevelopable waterfront strip in other locations. The expressway, which will be elevated with few cross connections to the waterfront, will limit local community view and access to the waterfront. (*See Urban Waters Special Study, available under separate cover from NERBC.*)

Several changes have taken place in the last few years which provide a basis for renewing Fall River's waterfront. In June 1965, the Battleship U. S. S. Massachusetts was brought to Fall River. Also installed were a Naval destroyer and submarine. The area near the battleship, known as Battleship Cove, has become a major tourist attraction. A new interstate highway (195) has been constructed, placing Fall River on a major route between New York, Providence, New Bedford, and Cape Cod. A new high level bridge on Route 195 makes the waterfront quite visible to travelers.

The Fall River waterfront development proposals, although currently low on the city's priority list, offer the potential of broadening the city's economic base and turning around its image of decline. It is important for the city to act since the state's current commitment of \$910,000, available only until 1975, requires the city to provide matching funds.

In order for the city to reconsider the development proposal, however, it would require a more thorough re-examination of the plan and its associated site improvement design as a basis for establishing cost estimates and a carefully worked out funding program.

Fall River has been planning for the renewal of this central waterfront area for a number of years. The "*Fall River: 2000*" Overall Development Plan, prepared in 1966 by the Planning Department, sets forth a proposal for this area under its "*Harbor Planning District*". The plan suggests tourist, recreation, and pleasure boat-oriented development, as well as new housing, and commercial and industrial development. The organizations responsible for the battleship, the U. S. S. Massachusetts Memorial Committee, Inc., and the U. S. S. Massachusetts Development Corporation, have prepared a detailed plan for the development of Battleship Cove.

The Solutions

By integrating master planning and development control functions in urban waterfront area, local governments can focus public interest and concern on relevant development issues and establish an administrative framework at the local level. In light of the previously discussed options, the following actions are recommended in order to enhance the reuse of urban waterfronts in a rational and balanced manner:

1. **Coordinate local waterfront planning and development.** Municipalities should prepare and inventory or plan for the long-term use or reuse of waterfront areas. In undertaking such activities, municipalities should give special consideration to factors such as the protection of flood prone areas, the preservation and enhancement of historic sites and buildings, the provision of public access easements (both physical and visual) in new development, building height, and so forth, consistent with *Critical Environmental Areas as specified in Chapter 3, Guiding Growth*.

While primary responsibility for initiating and carrying out

land use decisions should remain at the local level, the state should perform the following critical functions:

2. **Provide guidance and set criteria at the state level for priority waterfront uses.** Massachusetts, through its coastal zone management program, should develop urban waterfront planning and management guidelines and criteria for deciding priorities for uses to be incorporated into local waterfront master plans. Priorities should be established for water-dependent uses, water related uses, complementary uses, and low-priority uses.
3. **Review and coordinate waterfront use.** Massachusetts, through its regional planning agencies, and Department of Community Affairs, should exercise their powers to review and revise major waterfront development proposals of more than local concern.

At the federal level:

4. **Provide federal funding for state and local waterfront development plans.** The U. S. Congress and the Office of Management and Budget should approve adequate federal funding for state coastal zone planning programs, and for other planning programs which enhance waterfront redevelopment.

Implementation of coordinated local and state approaches to waterfront use should help to minimize fragmentation of decisions in waterfront area while recognizing the appropriate roles of the different levels of government. Agreement on appropriate guidelines and priorities should help to reduce conflicts between uses and increase the chances for a variety of uses along urban waterfronts.

More sensitive and sensible use of waterfronts will reinforce use of existing infrastructure and help to reutilize urban areas which have considerable economic and aesthetic potential.

CHAPTER 8 FLOODING AND EROSION

Past flooding in the Taunton River area has caused only minimum physical damage with little danger to the population. The major factor in this low damage history has been the existence of nearly 60,000 acres of inland wetlands (both open and wooded) — more than any other basin in the SENE region. However, these natural flood flow storage areas are threatened by steadily increasing development pressures. Development expansion which in any way reduces the storage capacity of natural bogs, swamps, marshes, and ponds will increase potential flood damage in the planning area which, at present, is at a relatively low level.

In general, the Study's recommendations emphasize that both inland and coastal flood prone areas be protected from development through implementation of non-structural flood plain management measures such as maximum protection of wetlands and strict development criteria. It is the Study's policy to recommend structural flood damage reduction measures only where there is high value development in small concentrated areas. Recognition of the multiple values of wetlands — not just as natural flood retention areas, but for wildlife habitat, water supply, recreation, and landscape quality as well — further strengthens the importance of wetlands protection as a policy for reducing flood damages.

The Situation

Inland Flooding

The planning area's extensive network of wetlands provides excellent storage for excess rainfall, and in the past has been responsible, to a great extent, for keeping damages at very low levels. In addition, the area's many truck farms have served to absorb excess rainfall runoff, and cranberry bogs have provided important seasonal floodwater detention, helping to retain flood stages along the various tributaries.

Development pressures, most noticeably for residential and agricultural use, are increasing, however, resulting in significant wetlands destruction, speeding up run-off, and accelerating the flood problem.

Numerous abandoned small industrial water dams existing along the tributaries are not operated in conjunction with each other and therefore do not exercise any positive influence on controlling flood heights. In times of flooding, these dams often present problems to residential and other land uses existing downstream. A major public effort was required to keep the old dams on the Mill River above the

city of Taunton from failing during the heavy flooding periods of 1968. Similar conditions also exist at other locations in the basin.

Flood Damages. The flood of record for the middle and lower sections of the Taunton River basin occurred in March, 1968, with a frequency of occurrence of about once in 50 years. In the upper third of the basin, the August 1955 flood was a somewhat larger flood event. Principally as a result of the extensive system of wetlands which acted as natural detention areas and helped reduce river flood stages, damages resulting from this flood were widely scattered and considered to be minimal.

Significant flood emergency costs, however, were reported by the Mayor of Taunton, amounting to more than \$900,000, which were associated with the threat of dam failures and the need for evacuation of a large area in the heart of the city along the Mill River. The principal trouble spots in Taunton were two industrial dams on the Mill River, Moreys Bridge Dam at the outlet to Lake Sabbatia and Mill River (Whittenden) Dam about 4000 feet downstream, which appeared as though they might fail structurally. Both dams are located directly above the central business district of the city and the failure of either or both dams would have resulted in damages much greater than \$900,000.

Other damage centers were reported along the various tributaries to the Taunton River. Damages due to flooding have occurred several times along Salisbury Brook and the Salisbury Plain River in the vicinity of Brockton, Massachusetts. August 1955 flood levels in the Brockton area would cause current damages of about \$95,000 along Salisbury Brook and about \$595,000 along the Salisbury Plain River. Over 250 residential properties, 50 commercial establishments, and 13 industrial plants would be affected by flood. As a direct result of the March 1968 flood, the Corps of Engineers undertook a detailed study to determine the need for channel modification and alternative measures. The detailed study, essentially completed in May 1975, indicated the lack of economic justification for federal participation, even for partial protection of the area.

Along the Three Mile River in Dighton, the Harodite Finishing and Raytheon Companies, Dighton Post Office, and many residences were damaged. Homes surrounding the Norton Reservoir were also inundated as the Rumford River overflows its banks. An industrial park and many residences were also damaged by the Rumford River in Mansfield. Damages occurred in the town of Chartley (in Norton) in the industrial and private sectors bordering the Wading River. In general, localized flooding did occur

throughout the basin but significant damages were centered primarily at the above locations.

Wetlands. There are nearly 60,000 acres of fresh water wetlands throughout the Taunton River planning area — more than any other planning area in the SENE region. The largest wetland is the Hockomock Swamp which has an area of approximately 7,500 acres. Located within the communities of Easton, West Bridgewater, Bridgewater, Taunton, Raynham, and Norton, this wetland represents a significant amount of flood control storage that is a major factor in minimizing the effects of flood producing storms. The Hockomock Swamp is located upstream from the city of Taunton and offers the city considerable protection. If a significant portion of the storage provided by the Hockomock were to be lost, there would be a serious increase in potential for flood damage in Taunton.

The Hockomock Swamp is under continual pressure for development. While most of this pressure is along the edge of the swamp, there are proposals to build a limited access highway directly through the swamp connecting Interstate 495 to State Route 25 in order to improve highway access to Cape Cod from Central and Western Massachusetts. In addition to the obvious biological and environmental consequences, highway construction could drastically change the hydrologic characteristics of the swamp, thus reducing its effectiveness for flood reduction. The presently proposed alignment of I-495 was adjusted by the Massachusetts Department of Public Works during the planning and environmental study process to minimize adverse impacts from the highway.

The Great Cedar Swamps in Middleborough, Halifax, and Hanson, the largest of which covers 19,000 acres are similarly threatened. The Cumberland Farms dairy complex, through the controversial agricultural exemption to the state Wetlands Protection Act, is filling and developing substantial portions of the swamp.

There are many other large wetlands located in most towns in the planning area. Many of these wetlands provide added channel capacity during flood periods to help pass flood flows, as well as to provide a large volume of storage which detains the floodwaters. Without these wetlands, because the basin is fairly flat, there is a potential for massive flooding of low lying areas. The loss of each acre of wetland increases the rate of stormwater run-off. This loss of natural storage areas is the major cause of flooding in the city of Brockton. Many sections of the stream channel, as well as bridge openings and culverts, are no longer adequate to carry the flow generated from storms that are moderate in magnitude. As a result, it may be necessary to rebuild many bridges and culverts, and to undertake costly channel improvement.

The area's predominantly flat terrain makes it prime development land. Many of the commercial and industrial

firms in the basin are located adjacent to wetlands. When larger facilities are needed by these firms, the most economical solution is often to fill part of the wetland and add on to the existing facility. In many cases, the filling of these wetlands is permitted to keep the industry from relocating. When faced with a loss in the tax base and other associated economic losses related to a plant closing, local officials often find it difficult to strictly enforce wetland controls.

The wetlands that cause the greatest concern with respect to flood control are the many small wetlands that are scattered through the basin and which, because of their size, are the easiest to drain and/or fill for development. Such wetlands are numerous, widely scattered and, while they appear insignificant taken individually, taken together they represent a significant natural flood control mechanism. Although a large wetland is more valuable in terms of flood control storage than a small one, priority problems are those related to the many small wetlands in the Taunton River basin.

Coastal wetlands in the planning area have been significantly reduced in recent years. Today, less than 300 acres of coastal wetlands remain, occurring as scattered areas along the Taunton River, the Assonet River, and other small tidal inlets.

Inland Erosion

Investigation by the Soil Conservation Service of erosion problems in the Taunton River basin indicates that there are serious erosion problems on less than 500 acres of land. These problem areas are gravel pits and areas undergoing urban development. The possibility of serious erosion problems exists on those lands which do undergo development for urban use. Much of the erosion damages can be avoided through a sound urban-environmental forestry program to retain as much of the native vegetation as possible. Erosion problems on cropland are minor and can be handled sufficiently by the conservation land treatment program. Pasture and forest, except for access roads, have little or no erosion problems at present.

There are no critical erosion problems along the river banks, though there are some small isolated areas where shoreline protection will be needed in the future, as development increases.

Tidal Flooding

Key problems experienced along the tidal shoreline of the Taunton planning area include tidal flooding and lowlands (particularly in the Fall River and Taunton areas) and inappropriate developments in the flood plain, including encroachment and misuse of marshlands.

The area of coastal influence (for purposes of discussing tidal flooding) extends from Mount Hope Bay to Weir Bridge in Taunton, a distance of about 16 miles. It also

includes the Assonet River.

Lowland flooding and shoreline erosion are caused by hurricanes, extratropical storms, and northeasters. The river is relatively protected from the northeasters, but such storms can be stalled in the area for several days and cause higher tide levels in the river over a sustained period of time. The estimated direct property damage by the hurricane of 1938 was estimated at \$1.2 million in Fall River, Freetown (Assonet), Berkley, Dighton, Somerset, and Swansea (Narragansett Bay planning area). Fall River suffered the worst damages, totaling \$1.0 million. During the 1954 hurricane, tidal flood losses for the same towns totalled \$5.5 million, with \$2.4 million damages in Fall River and \$1.1 million in Swansea. No damage survey was made at Taunton following the 1954 tidal flooding. A damage survey of the industrial area of Taunton subject to tidal flooding is scheduled to be made by the Corps of Engineers in fiscal year 1976.

A hurricane survey report for the Narragansett Bay Area, Rhode Island and Massachusetts, was published in 1966 by the Corps of Engineers. The report recommended a system of three massive ungated rock barriers across the three entrances to Narragansett Bay to protect the Narragansett Bay and Mount Hope Bay areas from future tidal flooding damages. Annual benefits for the entire protected area (estimated at over \$5 million in 1965) would have included direct hurricane flood protection, beach improvement, fishing from the barriers, and area redevelopment. However, local interests did not favor restricting the natural navigation openings of the Bay, and it was doubtful that funds would be appropriated for the local share of the costs. The project was never constructed, and the Corps of Engineers feels that a barrier to protect only the Taunton River could not be economically justified.

The Solutions

A number of alternatives were considered for reducing flooding and erosion damages. They are discussed and evaluated in the *Regional Report, Chapter 8*.

Recommendations

A major result of the SENE Study has been the classification of the region's resources according to their capability. Inland and coastal wetlands, estuaries, and beaches, have been classified as "A" resources, requiring the greatest degree of protection from development. Flood plains and hazardous coastal flooding areas (both to the 100-year flood frequency line) have been classified as "B" resources, which have very limited tolerance for development, but with proper management are suitable for compatible activities such as agriculture or recreation.

In keeping with these resource classifications, the major recommendation for this planning area is to:

- 1. Develop a Taunton Basin flood plain management program.** The Corps of Engineers, in cooperation with Massachusetts state agencies, should develop a comprehensive flood plain management program for the entire Taunton River basin. The program, to be carried out under authority of the ongoing Corps of Engineers' Pawcatuck/Narragansett Bay (PNB) study, should make maximum use of non-structural solutions.

Consistent with the policies and approaches described in *Chapter 8 of the Regional Report*, the study should investigate the implementation possibilities for non-structural solutions as authorized in Section 73 of the Water Resources Development Act of 1974. Although implementation of Section 73 has presently been deferred by the Office of Management and Budget, application of the cost sharing authority can be an important factor in making non-structural solutions more competitive than they have been. These would include flood plain zoning, wetland protection, flood-proofing, forecasting, etc. The study should also consider removal or maintenance of existing dams. Structural solutions should be recommended only for areas where non-structural solutions are inadequate. Detailed recommendations should be made to assist local and regional officials in preventing future flood damages. The study should be closely coordinated with the Soil Conservation Service, regional planning agencies, and municipal officials, and draw on the work of the Pilgrim area Resource Conservation and Development project of the Soil Conservation Service and other agencies.

In conjunction with a comprehensive program, and as a condition for future federal financial assistance, municipalities should:

- 2. Adopt local flood plain zoning preventing adverse flood plain development.** Municipalities should adopt flood plain zoning to prevent adverse development in flood prone areas (and particularly in the 100-year floodway) as defined under the National Flood Insurance Program.

This also includes incorporating inland and coastal wetlands, eroding areas, and storms of record on the map upon which the zoning is based. All related regulations — building codes, subdivision regulations, sanitary codes — should reinforce this policy of preventing adverse development and redevelopment in the 100-year flood plain. The regulations should also take advantage of the restrictive provisions of state wetlands regulation, scenic rivers programs, and the like.

Related to local zoning action are two recommendations

for controlling local sedimentation and inland erosion problems.

- 3. Establish local sediment and erosion control ordinances.** Municipalities, assisted by the U.S. Department of Agriculture and the Executive Office of Environmental Affairs, should establish local sediment and erosion control ordinances.

A model for such ordinances is included in the more detailed information prepared for the Study.

- 4. Establish forest buffer zones.** Municipalities should establish appropriate forest buffer zones within 200 feet of streams and lakes to preserve vegetation and maintain natural systems through forestry techniques to help keep non-point source pollutants from reaching sensitive water quality areas.

Municipalities with existing high and medium development pressure (see *Chapter 3, Guiding Growth*) should be among the first to implement these two recommendations.

In conjunction with a zoning program:

- 5. Acquire key wetlands and flood plains.** Municipalities and state agencies should investigate continuing possibilities to acquire those wetlands and flood plain areas most significant for flood damage reduction and protection, and which have water supply, wildlife, and/or recreation values.

Particular emphasis should be given to protection of areas classified as unique natural areas, and those located in areas subject to high and medium development pressure. Some specific areas for acquisition are discussed in the *Outdoor Recreation Chapter of this report*. More specific actions regarding wetlands protection are included in *Chapter 8 of the Regional Report*.

Protection of wetlands and flood plains is also expected to help existing structural flood protection projected do their job by keeping flood flows to within the design capacity of existing channels.

In built-up and heavily used areas such as Fall River, Taunton, and Brockton, alternative locations outside the flood plain may not always be feasible.

- 6. Locate activities in existing safe buildings in the flood plain.** Where location outside the flood plain is not feasible, municipalities should encourage private interests to locate in existing safe buildings in the flood plain, rather than permitting new construction in the flood plain.

Floodproofing, especially of existing buildings, is particularly appropriate where only moderate flooding is expected, where other types of flood protection are not feasible, or where activities on waterfront location need some degree of protection. Improved and expanded storm and flood forecasting and warning services, recommended in *Chapter 8 of the Regional Report*, will also be important in keeping down future damage costs.

Implications

This overall approach is a good deal more restrictive than the National Flood Insurance Program requires. But it does make full recognition of resource limitations and natural functions of wetland and flood plain areas. The SENE Study has found that all new development can be accommodated on C, F, and G lands (as discussed in *Chapter 3, Guiding Growth*), so that protecting A and B lands from inappropriate use need not be incompatible with a growing economy. In fact, a policy of resource protection and non-structural solutions is regarded as a significant step toward protecting the physical beauty of the region's landscape which is expected to be in the long-term interest of the SENE region.

CHAPTER 9 LOCATING KEY FACILITIES

One of the most difficult subjects to grapple with at the local level is the siting and operating of such key facilities as power plants, sand and gravel pits, petroleum refining, distribution, and storage sites, and solid waste disposal. Bluntly stated, they are unwelcome neighbors. At the same time, however, few people are willing to live with the consequences of not having enough of the vital products or services provided by these operations. The situation is further complicated by increasing competition from other potential users of the sites which are appropriate for these actions.

With respect to most of these issues, implementation of the recommendations outlined in *Chapter 9 of the Regional Report* will meet the needs of the Taunton planning area. One issue, however, has been receiving extra attention and is of specific relevance to the Taunton area.

The apparent existence of massive reserves of oil and gas off the New England coast at Georges Bank has generated considerable speculation of an economic boom for the New England region. Several studies have indicated, however, that the creation of a petroleum refining capacity somewhere in the region would have little real effect on the economy of the region as a whole. At the same time, however, there is no doubt that refining and related development can have significant local effects. One of the areas which received brief attention for such development is Bristol County, Massachusetts, overlapping the Taunton and Buzzards Bay planning areas. This *speculation*, combined with renewed interest in what are believed to be large, though deep, deposits of coal, creates the potential for a regionally significant energy center, although information is incomplete at this time.

PETROLEUM — RELATED INDUSTRIAL DEVELOPMENT

Both Massachusetts Institute of Technology Sea Grant researchers and consultants to the Council on Environmental Quality (CEQ) singled out Bristol County as a "test case" study area in which to measure effects of petroleum-related industrial development. The area was chosen for a number of reasons, including its proximity to the Boston and Providence market areas, relatively large available labor force, proximity to the anticipated Georges Bank oil field, ports at both Fall River and New Bedford, and availability of land for development.

Very briefly (since these detailed reports have been released to the public already) the CEQ consultants found

that development related to a large oil discovery on the outer continental shelf would induce an additional 75,000 new jobs locally, 120,000 for the region as a whole; and might induce population gains of from 40,000 to 150,000. Such activity could cause severe strains on existing and proposed municipal services, and could require 75,000 acres of land by the year 2000; 30 percent more than is expected to be developed under normal circumstances. Such development could also greatly increase hydrocarbon, particulate, sulfur oxide, and oxygen demanding pollutants, though new control techniques might mitigate this to some extent.

Original estimates of the size of potential oil and gas resources on Georges Bank have been dramatically reduced by the U. S. Geological Survey. As a result, total direct and indirect induced employment, as well as potential land and water resource requirements must also be reduced. It should also be noted that, without some kind of job training program for the local labor force, most offshore oil-related jobs will be filled by outsiders.

While the Taunton planning area represents only a part of Bristol County, it should be noted that the SENE Study identified only approximately 130,000 acres of developable land in the planning area, which, based on the past regional rate of growth, were not quite enough to accommodate the 2020 projected population *even without* the petroleum-related development. The implication is that residential development will have to occur at significantly higher densities than has been the case in the past if any portion of petroleum-related industrial development were to be accommodated. The only alternative would be to develop on fragile or Critical Environmental Areas identified on the SENE development capabilities maps (Plate 2).

With respect to land use, then, consideration of this area lies within the scope of the SENE Study's policy that such development be located inland near existing heavy industrial areas, or in areas having suitable existing utilities capable of being expanded without significant environmental or social disruption.

It should also be noted that terminal facilities for crude delivery (unless piped directly from the fields) and product distribution will have to be developed far offshore in Rhode Island Sound. While the southern half of Narragansett Bay has the depths to permit supertanker traffic, such development could be in conflict with the Bay's recreational and tourism economy, and the threat to the marine environment may well outweigh the benefits which might accrue from petroleum off-loading in the

Bay (*see discussion in Narragansett Bay Planning Area Report*).

Clearly this is a subject which deserves much greater attention than was possible in a study of SENE's scope. However, the recommendations detailed in *Chapter 9 of the Regional Report* can provide significant guidance should such development become a reality.

COAL MINING

The Massachusetts state geologist has filed a bill in the state legislature asking for a \$100,000 appropriation to test the depth and quality of known coal deposits lying underground roughly between Providence and Fall River on the

south and Foxborough and Bridgewater on the north.

Previous studies conducted in 1925 and 1944 have established the high quality of the coalfield but not the precise depth. The state geologist believes drilling may have to go as deep as 5000 feet to locate significant deposits.

Recognizing the clear need for decreasing the region's dependence upon oil, the Study recommends:

- 1. Fund coal deposit research.** The Massachusetts General Court should grant the state geologist's request for research funds to determine the extent and quality of coal deposits in southeastern Massachusetts.

NOTES

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